AGRICULTURAL CHEMICALS

A MONTHLY MAGAZINE FOR MANUFACTURERS, PROCESSORS AND DISTRIBUTORS

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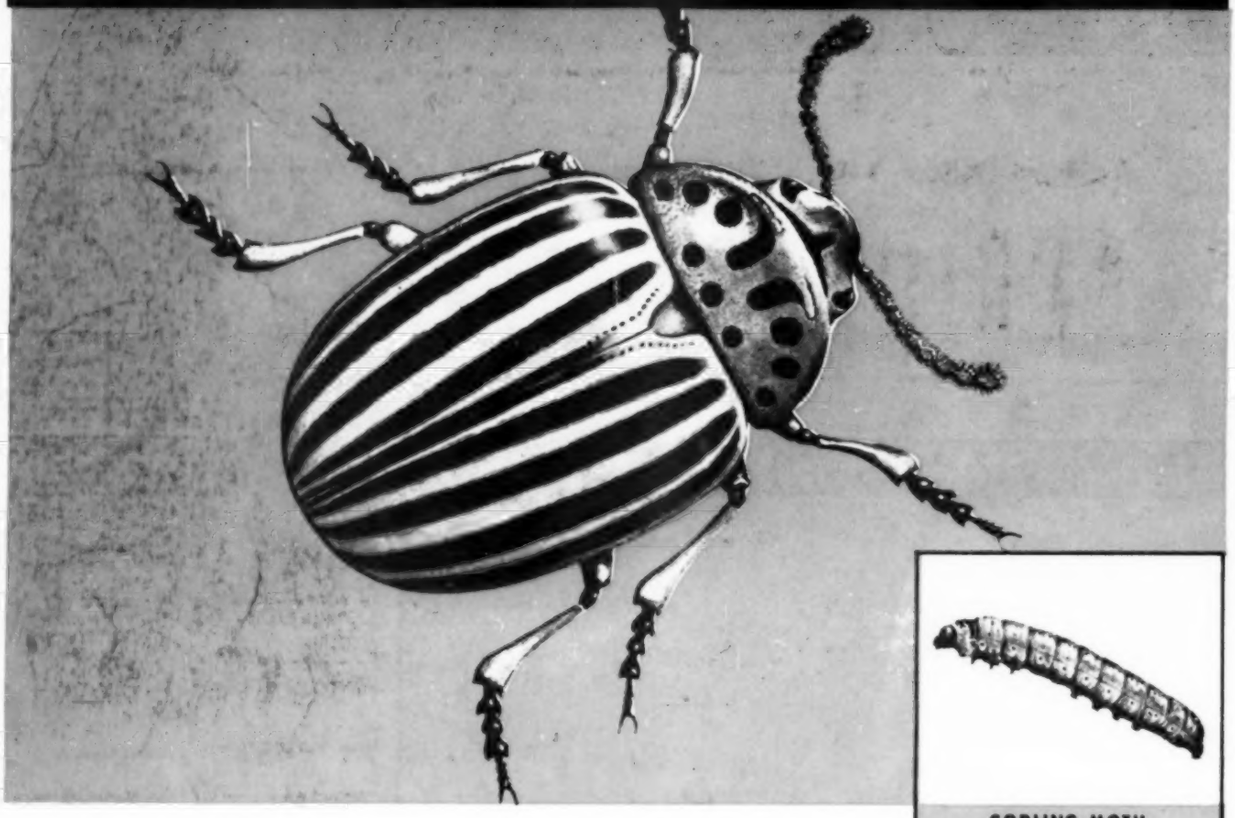
June, 1946

Vol. 1 No. 2

COLORADO POTATO BEETLE—costs potato growers an estimated $16,500,000 a year*



CODLING MOTH

COLORADO POTATO BEETLE

JAPANESE BEETLE

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J. T. Baker Chemical Co., *Executive Offices and Plant:* Phillipsburg, N. J. *Branch Offices:* New York, Philadelphia, Boston and Chicago.

**Department of Agriculture—Entomology and Plant Quarantine, 1938. Last figures available.*

Baker's Chemicals

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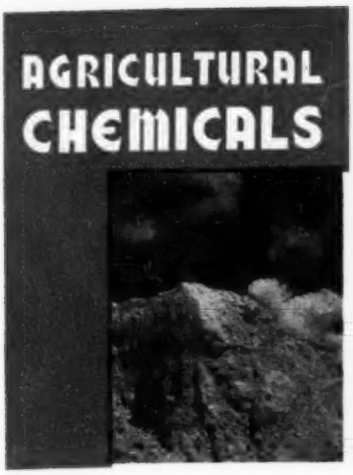

THIS MONTH'S COVER

Solidified vats of sulfur resemble mountains in their extent. Men atop this fifty foot vat have broken down the sides by explosive charges, and are "barring down" loose blocks of sulfur prior to its being loaded onto freight cars. See article on page 13. (Photo courtesy Texas Gulf Sulfur Co.)

JUNE, 1946
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In This Issue:

AGRICULTURAL CHEMICALS

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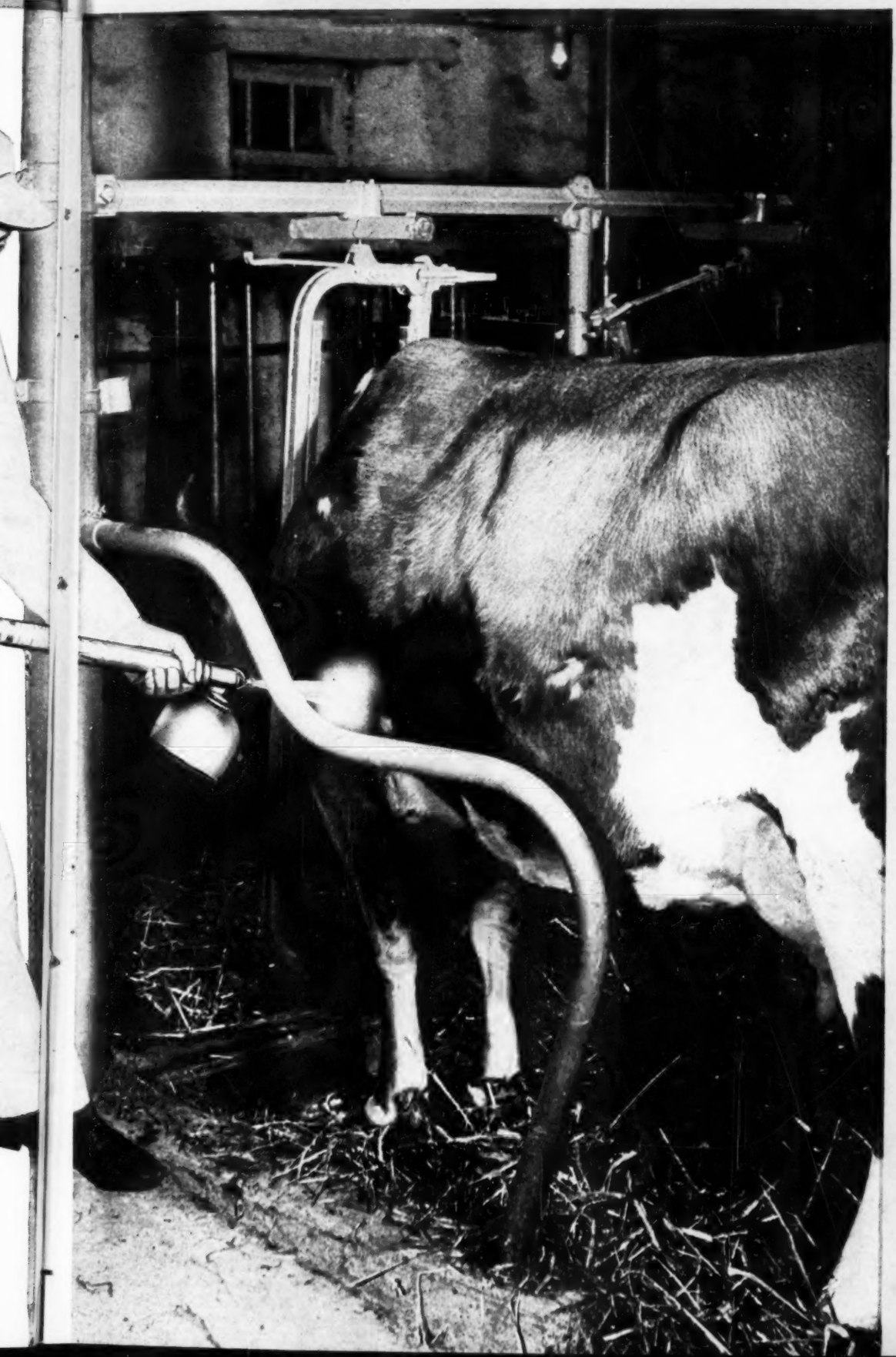

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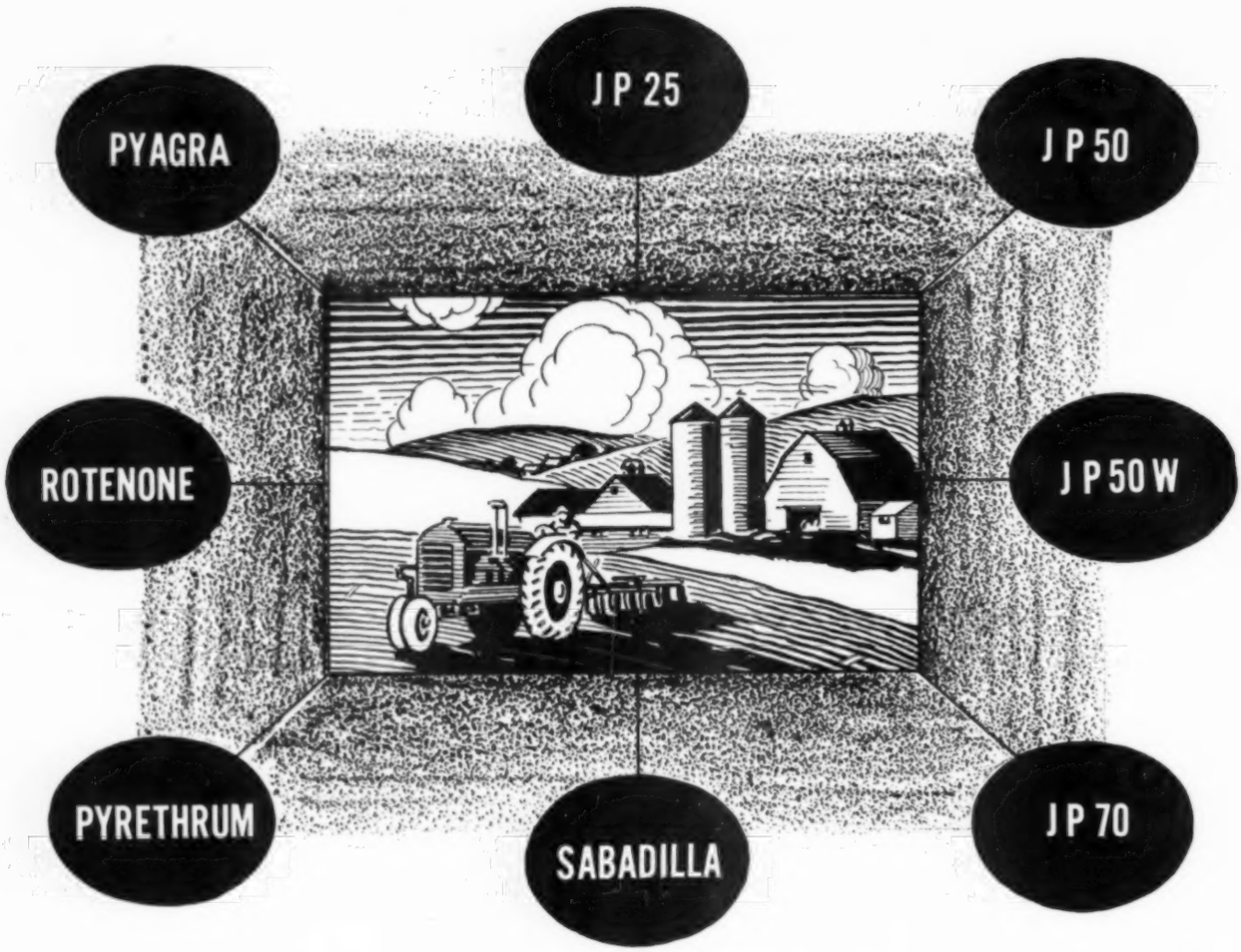

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THE EDITOR COMMENTS

AS the present session of Congress draws closer to adjournment, the chances of passage of the new Federal Insecticide Act grow smaller. The bill (H.R. 5645) has been referred to the House Rules Committee where it is likely to remain until the present tenure of Congress expires. For the industry as a whole, it is unfortunate that the new law could not have been compromised into passage at this time. Each year during which the proposed law is postponed increases the possibilities of further unsatisfactory state legislation and reduces the hope of countrywide uniformity in economic poison legislation. And it means that the entire federal legislative job has to be done all over again at the next session of Congress.

HAD many mixers, jobbers and dealers anticipated their needs in agricultural insecticides earlier this year, the present shortage of the old standbys might be considerably less acute than it is,—and is likely to be before the present season is over. Apparently going on the supposition that the entire nature of the agricultural insecticide business was due to change practically over night and that newer things would replace the arsenicals, cryolites and other old-time products this season, failure to order these latter was widespread. As a consequence, they were not produced in needed tonnage and will become scarcer as the season progresses.

Blame for this development has been placed on the overemphasis and widespread publicity which the newer developments have been given throughout the past year. Users, large and small, — and this reaction has traveled back through trade channels to manufacturer and mixer,— apparently assumed the belief that this year the new would pretty much replace the old. Anticipating that there would be ample stocks of the newer things for their needs, they preferred to wait rather than order supplies of the old standbys. Warnings by U. S. Department of Agriculture and state officials went unheeded. Thus, today many firms in the trade and large users also find themselves out on a limb, misguided apparently by too much publicity.

FROM the current fertilizer picture, nitrogen and potash will each be about 100,000 tons short of United States needs for 1946 and 1947. The outlook for superphosphate is not quite as gloomy. Total requirements for 1946 and 1947 are estimated at 800,000 tons of nitrogen, 800,000 tons of potash on a basis of K_2O, and 1,850,000 tons of phosphoric acid on a basis of P_2O_5. These figures came out of a recent meeting of the Fertilizer Industry Advisory Committee in Washington, which meeting was considered of sufficient importance that it should be addressed by the Secretary of Agriculture to emphasize the needs and shortages of fertilizers in the world markets.

Numerous recommendations have been made to channel more basic materials into fertilizer production including restoration of certain government sulfuric acid plants and government expansion of ammonium sulfate facilities to take care of export needs. Potash salts have been returned to allocation by the Civilian Production Administration. These developments might give the impression that the availability of basic fertilizer materials was less than in preceding years. However, this was not the case. The season just closed was probably the largest in shipments in the history of the industry. But, expansion in demand was so great as to give the appearance of scarcity. And, according to one leading opinion, the industry can expect at least two more years of the same heavy demand. Then, when production facilities reach their maximum, we may face the cold grey dawn of a more sober period.

A guest editorial written especially for this issue of Agricultural Chemicals

As spraying advances... agriculture moves ahead

By C. Chester Du Mond
New York State Commissioner of Agriculture and Markets

AS I recall our spraying operations of thirty years ago, I cannot help but be impressed by the changes which have taken place in the use of insecticides and fungicides since that time. We then were using Paris green as our chief insecticide, mainly for the control of the so-called potato bugs, and some arsenate of lead on fruit. Home-made bordeaux and home-boiled lime sulphur were our principal fungicides. It was considered perfectly adequate if we sprayed our apple orchards twice—once for the eradication of San Jose scale, and at calyx time for the control of scab and codling moth.

Three great changes which directly affect the insecticide and fungicide business have taken place since that time. First, the intensive production of fruits and vegetables in selected areas most suitable for these crops has encouraged the development of insect and fungus pests, so that a spray program using four or five times the number of spray applications and a much more thorough covering of the plants or trees are now necessary if a reasonably clean crop is to be produced. Second, a great advance has been made in the design and volume capacity of our spray machinery. It would be literally impossible to apply the amount of spray material in use today, if it were necessary to apply it with the equipment in use at that time. Third, the business of manufacturing spray materials which would meet the requirements of our farm producers of foods and fiber was practically in its infancy. The great number of varied insecticides and fungicides now available and in use for meeting the specific requirements of our growers represents a major achievement of the chemical manufacturers.

These two latter changes have come about as a direct result of expensive research work carried on by our State and Federal Government experiment stations and by the chemical manufacturers themselves. The value of this research cannot be overestimated. A great part of it has been accomplished by painstaking effort on the part of scientists who have never been adequately compensated financially for the effort they have so unselfishly expended. Their reward has been the satisfaction of a job well done.

We are now going into a period when our use of insecticides and fungicides will be greatly expanded. New materials are being

(Turn to Page 60)

Sulfur Outlook...

Survey shows ample crude sulfur available, but bottlenecks exist in output of phosphate rock and sulfuric acid for use in fertilizer.

WHILE shortages of fertilizer raw materials, nitrates, potash and phosphates, threaten food production on a world-wide basis, supplies of sulphur are plentiful. In the general agricultural chemical picture, sulfur stands out as a bright spot among the shortages and other problems. Crude sulfur above ground in producers' stocks was reported at the beginning of 1946 to amount to 4,003,917 tons. This stock pile which exceeds consuming needs for a full year is the best assurance against shortages in the anticipated critical years immediately ahead. Although shipments of sulfur last year by producers exceeded production by nearly 100,000 tons, adequate reserves have precluded any serious depletion of supplies.

As is well known, the importance of sulfur in the agricultural chemical field,—as well as to the entire economy of the nation and the world,—lies in the fact that it is the basic raw material for sulfuric acid. In agriculture, the use of elemental sulfur in fungicides, insecticides and fertilizers is highly important, and as tonnages go, runs to a rather high figure, 100,000 tons per year. But this quantity of sulfur is insignificant by comparison to that which enters agriculture indirectly as a raw material for sulfuric acid and the production of superphosphates, ammonium sulfate and other chemicals of lesser importance.

Today, about 75 per cent of all sulfur produced goes into the manufacture of sulfuric acid and more than one-third of the total sulfuric acid produced goes into the production of fertilizer chemicals. According to *Chemical and Mettallurgical Engineering*, 580,000 gross tons of crude sulfur were consumed in the United States for fertilizer and insecticides in 1944. This amounts to 20 per cent of the domestic crude sulfur shipments that year. In arriving at a total figure for sulfuric acid, however, consideration must be given to the output from smelter gases and pyrites, of which a large percentage is put into agricultural use.

At the end of 1945, the plant capacity for sulfuric acid production in the United States was approximately 10,000,000 net tons (figured on a 100 per cent basis) which did not include the output of government plants. Of this total, the manufacture of superphosphates consumed roughly 3,000,000 tons, the largest single use for the acid. It exceeded the amount of acid used for all other chemical manufacture and was about three times as great as sulfuric acid used in petroleum refining. It is interesting to note that high up on the list of uses for sulfuric acid is another fertilizer product, ammonium sulfate, which accounted for 650,000 tons of acid last year.

Assuming that all post-war

CRUDE SULFUR—1945	*Gross Tons*
Production	3,736,889
Shipments (Total inc. exports)	3,833,292
Stocks at Mines (Dec. 31, 1945)	4,003,917

uses of sulfuric acid other than superphosphate will approximate the figures for 1942,—about six million short tons, according to the Groggins report,*—this will make available about four million tons of acid for superphosphate manufacture. Groggins notes that this would be sufficient to produce 11.4 million tons of superphosphate which could be increased if spent acids were channeled to fertilizer plants. Although this large output of superphosphate represents three times the American pre-war production, it is still well under the 15 million ton ideal which the Department of Agriculture fertilizer people believe should be used every year by American agriculture. Thus it would seem that the post-war consumption of sulfur as sulfuric acid in fertilizer production bids fair to outstrip other uses still further.

Production of sulfur in the United States at the present time is held ample to supply enough of the mineral for current needs. But sulfur mining in Sicily, Italy, Japan, and elsewhere is far from the pre-war normal which throws an extra burden on American output and will continue to do so until regular output is resumed in other countries. Likewise, an abundance of crude sulfur in the hands of American producers does not mean that it is immediately available for use in agriculture, particularly in fertilizer production. The conversion of sulfur to the acid is still something of a bottleneck, while the production of phosphate rock is insufficient to take care of present needs for super phosphate manufacture. (Consumption of phosphate rock in 1943 was 5,644,240 gross tons, while production was 5,369,967 gross tons, a deficiency of 274,273 tons). Where the use of elemental sulfur as such in agriculture is concerned, there is no problem of raw material or processing bottleneck to be faced.

* Chemicals and Food Production, by Philip H. Groggins, from nineteenth annual Priestly lectures sponsored by Phi Lambda Epsilon, Pennsylvania State College, 1945.

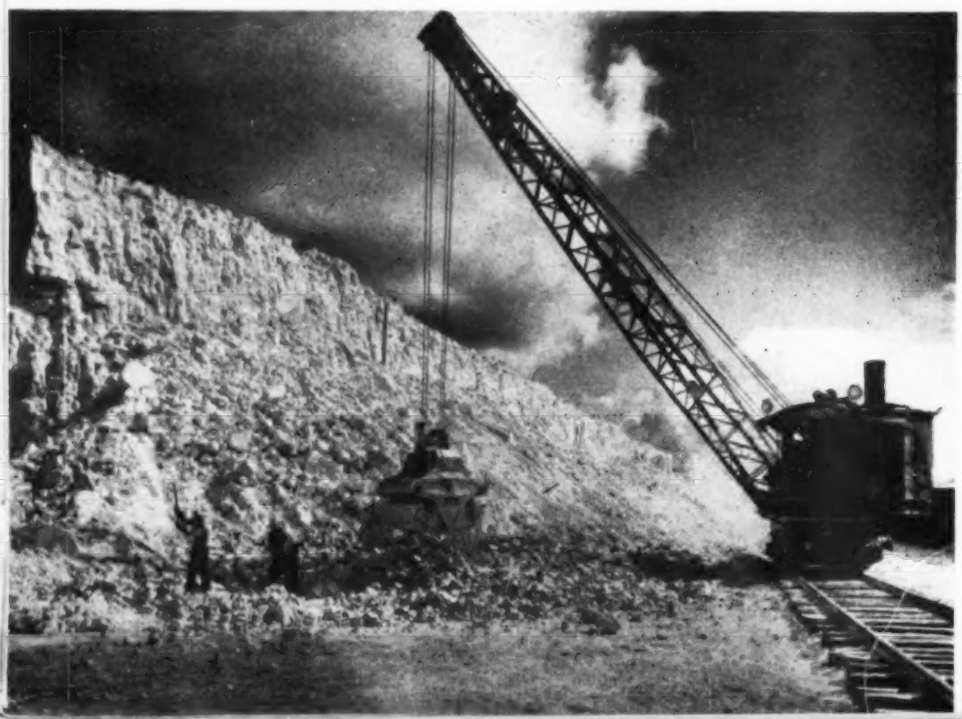
Texas, Louisiana First

AMERICAN deposits of sulfur lie chiefly in Texas and Louisiana. Texas furnishes some 80 per cent of the nation's supply of crude sulfur, and Louisiana the other 20 per cent. The mineral is obtained in the United States by the Frasch method, forcing super-heated water into deposits of calcite at temperatures above the 240° F melting point of sulfur, and causing the molten material to come to the surface. There it is stored in huge vats measuring as much as 1,200 feet in length and from 160 to 200 feet wide, at a height of 50 feet.

In foreign countries where mining methods are much more crude, production is naturally much slower even in normal times. But since the disruption of war, mines in Italy and Japan are not expected to contribute much tonnage to the world's supply of sulfur for some time. Chile, though not affected directly by the war, has natural handicaps to overcome in that sulfur mining is in the high peaks of the Andes far removed from rail lines, and in weather usually bitter cold.

The four companies in the United States extracting crude sulfur from the earth by the Frasch method faced no "reconversion" from war to peace with the end of hostilities. The industry's work goes on in an identical manner regardless of the use of its products. Despite the fact that large stocks of sulfur are in their possession, the mine owners are not disturbed even though the same situation in other commodities might be reason for worry on the part of producers. Due to conditions peculiar to the industry, such stocks are not abnormal, and are not expected to depress the market. So far as sulfur producers are concerned, the principal uncertainties lie in the realm of national and international trade. The industry will naturally enjoy high domestic volume with national prosperity, while the export market will depend upon such factors as trade agreements, monetary-exchange rates, and the degree of national self-sufficiency practiced in the importing nations. American sulfur is of high quality and its price reasonable, two features attractive to foreign buyers.

Regardless of the amounts of sulfur shipped abroad for agricultural and industrial needs, farm



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Molten sulfur solidified in huge vats up to 1,200 feet long, 160 feet wide and 50 feet high is broken down by explosives for loading. Such a "vat" as seen here contains approximately 500,000 tons of sulfur. As shown, the crude material is picked up for loading onto railway cars. (Photo courtesy Texas Gulf Sulfur Co.)

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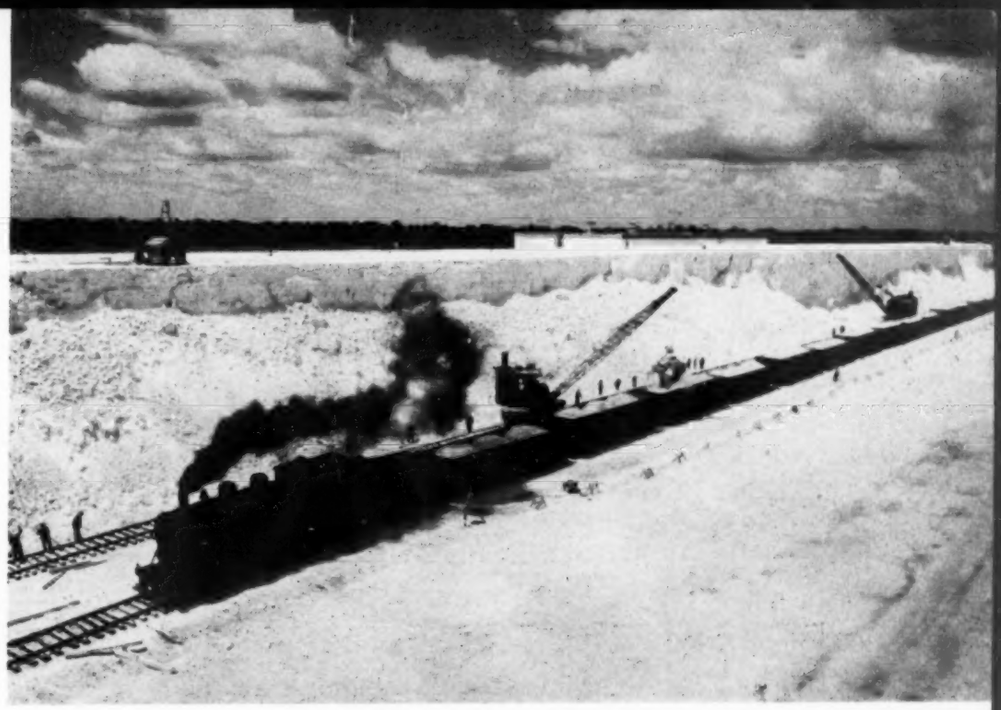

A train of gondola cars loaded with sulfur being moved to the scales for weighing preceding its trip to Galveston, Texas, where the cargo is loaded onto water craft. Note length of sulfur mound extending to right of picture. (Photo courtesy Texas Gulf Sulfur Co.)

lands in the United States are in need of sulfur over a widespread area. According to a survey reported by William Crocker of the Boyce Thompson Institute, numerous regions of the U. S. have been found where the amount of sulfur in the soil is an insufficient quantity to give maximum yield of legume crops, and where additions of sulfur, either in elemental form or as sulfates, increases production. Sections of Oregon, northern Idaho, Montana, Iowa, Arkansas and other states experienced increased yield when treated for sulfuric deficiency, the report states. In western areas where the soil has become too alkaline for profitable use in agriculture, successful reclamation has been made with application of sulfur to neutralize the excessive alkalinity of the soil. During 1944, the state of California alone used 36,974 tons of sulfur and nearly 400,000 tons of gypsum in neutralizing its alkaline soil. As an experiment, sulfur was recently added to calcium meta phosphate, and the mixture distributed to farmers in the Tennessee Valley in an effort to preserve the land for heavier crop production and against loss from leaching and erosion.

Sulfur is used extensively as a fungicide, of course, and for such use is ground into "flour," or about a 325 mesh consistency. Its fungicidal properties are widely known in agricultural circles, and a considerable portion of untreated sulfur is used for this purpose.

Addition of sulfur to the soil through the atmosphere does not keep pace with losses incurred through leaching away of sulfur in most cases. Atmospheric contributions of sulfur come largely through the presence in the air of sulfur dioxide from burning coal. As long as twenty years ago Crocker reported that rain carries away three times as much sulfur from the soil as it carries down from the air. For instance, experiments in Iowa showed that while 15 pounds of sulfur per acre were added to the soil by rain, 65 pounds were being leached out. Investigations in other states tended to add evidence to this conclusion.

Amounts of sulfur in the air are difficult to estimate since the percentage of sulfur in coal varies greatly with different fields, and even in different samples from the same vein. Figuring on the basis of averages, Crocker states in his report of a number of years ago, that the amount of sulfur passing into the atmosphere is about 3.13 pounds per acre for the whole of the United States. Investigations indicate that a sulfur hunger can become general throughout large areas, and that to avoid such a contingency, systems of fertilization should be inaugurated to supply to the soil from time to time a sufficient quantity of sulfur to meet the losses sustained by cropping and drainage. This, of course, is in addition to the usual application of nitrogen, potash and phosphorus.

To back up these findings, tests have been made in states where sulfur deficiencies exist. They showed that when sulfur fertilizers are used, large increases in yields of leguminous crops result. These increases are due to the action of sulfur as a plant food, and not to any indirect stimulative effect. This was determined in view of the fact that nitrogen, potash and phosphorus sources, when used without sulfur, frequently fail to give as great an increase. Addition of sulfur, it was found, not only increased the yield, but also increased the protein content of the crop.

Agriculturalists find a wide use for sulfur in various forms aside from its role as an insecticide, fungicide and fertilizer. It provides an economical diluent for insecticides, including DDT, rotenone and pyrethrum, and when used in this manner gives an additional fungicidal property to accompany the usual action of the insecticide. Sulfur dioxide is used as a fumigant. Sulfur is also an ingredient used in livestock dips, and is employed in the preservation of fruit in transit from loss of vitamin content. Sulfur dioxide prevents the escape of stored vitamin in fruits, and has been used in treating fruit and juices for shipment overseas.

—Photo Courtesy Michigan State College

Airplane Spraying of Insecticides

By William Lee Popham
Bureau of Entomology and Plant Quarantine, USDA

JUST 25 years ago the first insecticides were distributed with an airplane. What does a quarter century of progress show? How accurate were the prophesies of the air-minded entomologists who arranged and observed the results of these early experiments? Where does aircraft fit into the pest control picture today? What are the prospects for the future—what responsibilities should men who engage in this work assume—and what kind of equipment should they use? An air-minded and DDT conscious public await answers to these and similar questions. With many Army and Navy trained pilots indicating their intention to engage in commercial crop dusting and spraying upon returning to civilian lives, it is appropriate that we take stock of developments. That the airplane has an important place in pest control work is accepted. It has certain advantages over ground dusters and sprayers—but it has some shortcomings as well.

In 1921 an Army pilot flying a Curtis H Model (first world war pilot training plane) was loaned by the United States Air Service to distribute lead arsenate over a grove of catalpa trees near Dayton, Ohio, in an effort to poison the larvae of the catalpa sphinx which were defoliating the grove. Flying 25 to 50 feet above the tree tops the dust was released from a quickly assembled hand-operated device attached to the outside of the fuselage. The results of this experiment were widely publicized and a popular report of the operation appeared in the March 1922 issue of the *National Geographic Magazine* under the title "Fighting Insects with Airplanes," by C. R. Neillie and J. S. Houser of the Ohio State University, Agricultural Experiment Station. The authors were among the first to visualize the possibilities that airplanes offered for crop pest control work.

In 1922 Dr. B. R. Coad, in charge of the United States Bureau of Entomology's Delta Laboratory for cotton boll weevil investigations recognized that aircraft offered unlimited possibilities in controlling the boll weevil, which by that time was destroying a quarter of a billion dollars worth of cotton anually. Reporting on the results of his initial experiments, Dr. Coad states that, "The speed of operation was at least 100 times as fast as the best mule drawn machine." The new method saved chemicals, greatly reduced labor requirements, and permitted immediate treatment when the condition of the crop showed treatment advisable, although the fields might be muddy or otherwise inaccessible to ground machines. The need for engineering talent in devising methods of releasing an even flow of dust into the pro-

peller blast of a plane was obvious; so the interest and cooperation of the Huc-Daland Airplanes, Inc., was enlisted. In 1924 Huc-Daland Dusters, Inc., began boll weevil control operations on a commercial scale. Thus, began a new industry destined to prove a forerunner of extensive insect control operations closely associated with military operations during World War II.

came a topic of scientific discussion.

In 1927 five thousand acres of sugar cane were dusted to control the sugar cane moth borer. The same year an airplane was used to dust spruce and balsam in an attempt to control a spruce budworm outbreak on Cape Breton Island, Canada. By this time planes were recognized as standard equipment for boll weevil control. In 1931 C. J. Drake and G.

Use of aircraft for spraying and dusting insecticides and other agricultural chemicals is no longer experimental. Abundance of equipment and increasing personnel solve some problems, but others still await satisfactory solution.

While Americans were the first to recognize that the airplane offered new opportunities in man's fight against destructive insects, investigations of a similar character were undertaken in Germany in 1925. A stand of mixed timber was treated to suppress a severe outbreak of the nun moth. The results were officially reported as, "excellent with no apparent harmful effects on birds or game." Airplane dusting for locust control was tried by the Russians. A forest plantation in the vicinity of Haguenau, France, was dusted in 1924. Mosquito breeding areas were treated with Paris green in various parts of the United States, in South Africa, and elsewhere, all prior to 1930. It is of interest also that in 1926 a Mr. Amery, appearing before a British Imperial Conference concerned with insect problems in Africa, forecast that the day was close at hand when the airplane would be used to eradicate the tsetse fly, dread carrier of sleeping sickness. The elimination of malaria carrying mosquitoes from entire continents be-

C. Decker, Iowa State Entomologists, supervised the distribution of the first wet mash grasshopper bait, a bran, sawdust - sodium arsenite mixture, from an airplane.

The encouraging, even spectacular, results obtained with crop dusting planes in the beginning were not accepted without some apprehension on the part of leading scientists. Entomologists conscious of the important role of pollinating insects in our agricultural economy recognized from the start that any such wholesale destruction of insects would certainly destroy some of our friends as well as our foes. The drift of dust from a field receiving treatment to other kinds of crops in adjacent fields caused trouble in the beginning and has continued to do so. Airplane operations were costly unless large acreages were involved. Persons engaging in contract dusting were faced with relatively short work seasons making necessary other uses for their equipment during an important part of the year in order to realize a reasonable return on their investment.

During the 1930's adapting aircraft for dispensing insecticidal dusts developed steadily but without fanfare. Notable achievements were the construction of hoppers and venturi releases which would give an even distribution of coarse wet grasshopper bait as well as dust, a device for distributing a lead arsenate "mash" from an autogiro, and improvised spray equipment for applying oil to mosquito breeding grounds, and weed killers and defoliants to crops and crop lands. In 1938 B. M. Gaddis, then directing the Federal-State cooperative grasshopper and Mormon cricket control program for the Bureau of Entomology and Plant Quarantine, was authorized to purchase two specially built biplanes for distributing poison bait for the control of Mormon crickets in otherwise inaccessible areas of the Rocky Mountain States. Under the direction of Mr. Gaddis, C. N. Husman, mechanical engineer who had been devoting attention to the development of ground equipment for distributing grasshopper bait, undertook to design and construct hoppers with improved agitation and venturi releases for these planes. The results of his work were published in 1940.

By 1939 there were an estimated 200 planes in the United States equipped for crop dusting. Installations were not standardized and most planes in use for the purpose had been converted by individual owners or at local machine shops. Some of the assemblies were good but many not so good. The demand for airplane dusters was limited and manufacturers devoted little effort to designing either planes or insecticide distributing devices especially for this purpose. The types of aircraft most commonly in use as crop dusters during the 30's were the biplanes powered with OX-5 or OX-6 Curtiss engines. These included the Waco 9 and 10, Travelaire 2,000 and 4,000, Stearman (early models), Curtiss Commandaire, American Eagle, Swallow and New Standard, which to a considerable extent had replaced the Curtiss JN-4, widely known as the "Jenny," and the De-Haviland D-H models of the 1920's.

Prior to 1940 most dusting with aircraft was in the cotton and vegetable growing areas of the south, southwest, and eastern seaboard. In 1939 California reported 223,000 acres of crop and range lands treated in this manner. Involved were 25 different crops, some 20 different pests (insects and diseases), and 15 different insecticides and fungicides. Crop dusting with aircraft had become a common and preferred practice in many areas, but owing to the economic status of farmers during depression years expansion in the industry did not keep pace with developments in aviation generally.

Application of Sprays

IF INSECTICIDAL dusts could be applied successfully from aircraft, how about sprays? Many standard insecticides and fungicides are much more effective when applied in this manner but to secure adequate coverage of fruit trees, lush growing field crops, forest and shade trees, or citrus groves may require 300 to 500 gallons or more of water per acre. To handle any such quantities of material with aircraft was out of the question — costly even with ground equipment. However, if sprays would do the job when applied as concentrates, a few gallons of highly toxic material per acre, this objection would be overcome.

In 1931-32, S. F. Potts, while attempting to improve insecticidal dusts used experimentally for controlling Gypsy moths in New England, conceived the idea of treating forested areas with a lead arsenate wet mash to which could be added an adhesive; thus overcoming the uncertainty of dust applications which were frequently washed off before they had accomplished their purpose. In 1935-36 Mr. Potts gave technical assistance to Autogiros Inc. and representatives of the Morristown, N. J., National Park in developing equipment that would dispense a highly concentrated lead arsenate, linseed oil formulae from a rotary winged plane. During this period 200 acres of National Park timber infested with cankerworms were treated with encouraging results; although costs were such as to discourage other than limited experimental applications.

In 1937 work on distributing devices was expanded and intensified, when Gordon Galloway and William Campbell were directed to explore further the possibilities of using aircraft for treating forested areas infested with Gypsy moths. They were soon joined by Pilot Donald Whittam and the combination of Campbell and Whittam has since taken the lead in the development and improvement of mechanical devices for distributing liquid insecticides over timbered areas.

Although the idea of applying liquid insecticides as concentrates was by no means new when the war came on, it remained for the emergency faced by our military forces advancing against mosquito, fly, and Jap infested islands of the South Pacific, and the discovery of the insectidal properties of DDT to bring into focus the real opportunities for suppressing insects with highly concentrated insecticides applied as finely atomized liquids. Of course DDT kills by contact; it is extremely toxic to mosquitoes and flies, and as a residual spray it is amazingly effective for an extended period after treatment.

If military personnel could be protected from malaria, dengue, and other insect borne diseases encountered in the combat areas of the South Pacific, one of the more difficult problems confronting military strategists would be solved. This was the situation that existed when the National Research Council, the Office of the Surgeon General, the Malaria Control units of the various branches of the armed forces and the Bureau of Entomology and Plant Quarantine of the U. S. Department of Agriculture initiated a closely coordinated program of developmental work in this field.

At the Orlando, Florida, laboratory of the Bureau of Entomology and Plant Quarantine, E. F. Knipling and associates demonstrated DDT against the insect vectors of tropical diseases. Practical methods of application under combat conditions were sought, and C. N. Husman, al-

ready experienced in the use of aircraft for insect control, and O. M. Longcoy, pilot, were added to the Orlando staff. Their experience with the L-Series Army aircraft and a biplane of the Stearman type supplemented research conducted at Army and Navy bases to determine simple methods of converting combat planes to insecticide sprayers. It was essential that proposed installations be of a type readily constructed from stock materials available at forward bases, simple to operate, and easily dismantled to permit use of the planes for other purposes.

Wartime Uses

THE effective campaign against insects in the South Pacific ranks as one of the outstanding scientific achievements of the war. The experiences of Major Dave Hall, in charge of Insect Control in the South Pacific for the Army Air Transport Command, is illustrative of the work done by many military entomologists at forward bases throughout the Pacific theater. Major Hall supervised mosquito and fly control from New Caledonia to Tokyo in areas totalling more than a half million acres. C-47 type planes were equipped for spraying an oil solution of DDT as and when needed, utilizing any materials and shop facilities at hand. The insecticide was carried in three cabin tanks, each with a capacity of 335 gallons which were firmly anchored to the floor of the plane with angle irons and steel cables. The liquid was released through a constant flow tank into a 3-inch tube fitted with carefully calibrated apertures. It was possible to vary from 10 to 200 gallons per minute the rate at which the insecticide was discharged into the venturi. The planes were flown at an average height of 300 feet at 150 miles per hour. Under ordinary circumstances the insecticide was released at the rate of 25, 50, or 100 gallons per minute which was equivalent to one pint, one quart, or 2 quarts per acre. The width of the spray swath laid down by a C-47 was roughly calculated to be three times the elevation of the plane at the time the insecticide was released, and the output was governed accordingly.

The results of such spraying activity over camp and combat areas brought health and comfort to our boys at the front in a manner which can hardly be exaggerated. Official records show that the incidence of malaria and dengue on many Pacific islands was reduced to an unbelievable minimum.

It was natural that under these circumstances much should be learned in a short time about airplane spraying for mosquito and fly control. Thousands of our Army and Navy trained pilots, alert to new developments with post war possibilities, are now wanting to engage in commercial dusting and spraying. Already hundreds of war surplus planes of the L-series and advance trainer type have been acquired by veterans and equipped for such work. Thus it is reasonable to expect that custom work of this type may shortly become a highly competitive business, and those who elect to acquire and equip planes for the purpose should give careful consideration to the potential demands for their services, the initial cost of the equipment that must be acquired, and the amount of time that may be necessary to become established with farmers, resort owners, and others who will rely on custom spraying or dusting to protect their interests. Insect outbreaks cannot be predicted with any degree of accuracy, and the demands for custom spraying and dusting must be expected to fluctuate widely from year to year.

Briefly, airplanes are now used for mosquito and fly control, to dust cotton for the control of cotton insects, sugar cane for borer control; for treating vegetable crops in California, Arizona, the Lower Rio Grande Valley of Texas, in Florida, along the eastern seaboard, and to a limited extent in other localities where acreages are such as to warrant large scale operations. Planes are used for distributing bait for the control of grasshoppers and Mormon crickets in Western States; for planting rice; and to a limited extent for reseeding

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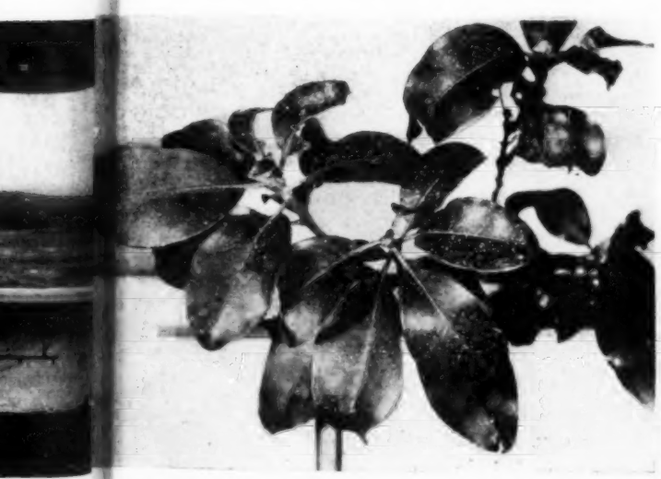

Plant Hormones

TWENTY years ago, plant hormones were of only theoretical interest. Today they have become familiar tools of agriculture with many important actual and potential applications, because of their ability to alter or regulate in various ways the growth and development of plants. Although there is much yet to be learned, plant hormones have already proved their worth in propagating plants from cuttings, preventing preharvest fruit drop, inducing seedless fruits, inhibiting buds and regulating flowering. Still unsettled is their value in treating seeds, while their usefulness in other phases of plant growth regulation is still under investigation.

Although perhaps not correctly used in the strict scientific sense, the term plant hormone has come to connote a group of compounds variously called growth regulators, growth control agents, growth substances, auxins, growth hormones, and phytohormones. As remarked by Yocum,(1) these materials are used to condition the growth of the organism rather than to build its structure. Put another way, it might be said that the purpose of using plant hormones is not to regulate the size of the plant but rather to increase the possibility of its producing more and better crops.

Plant hormones and hormone-like substances are capable of initiating specific growth effects, of regulating the enlargement of the organism or its parts, and of controlling differential growth.(2) Methods for evaluating the activity or effectiveness of such materials have been worked out and described in detail. (3,4,5) As summarized by Zimmerman,(6) the activity of these growth substances is usually detected in plants by curvetures resulting from induced cell elongation or by formative effects on later growth. The former response occurs within a matter of minutes or hours. Formative effects, however, do not appear until the plant has had time to grow and produce new organs; a matter of days or weeks. The first evidence is noted in the new leaves which are modified in size, shape, pattern and texture. Later the effects of the chemicals are noted on flowers, fruit, growth habit, and correlation phenomena of organs. Failure to induce curvetures, cell elongation, or formative effects means that the compound is inactive as a plant hormone or plant growth regulator.

Long Hormone History

THE practical history of plant hormones may be said to have begun in the early nineteen thirties with the reports of several Dutch investigators. With a method available for detecting plant hormones, it was possible to isolate the first growth-promoting substance from plants. Called auxin, it was later discovered that two closely related substances were responsible for the growth-promoting effects and consequently they were named auxin-a and auxin-b. Further investigations resulted in the isolation from urine of a substance capable of causing the same kind of effects when applied to plants. This growth substance was identified as indoleacetic acid. Because of its auxin-like effects it was called heteroauxin, a name still used by some workers. Meanwhile, workers at the Boyce Thompson Institute for Plant Research in Yonkers, N. Y., had investigated the use of indolebutyric acid, phenoxyacetic acid and a number of other compounds. By 1936, the list of active plant growth substances or synthetic plant hormones had been greatly extended.(7,8)

Even though only minute quantities are required to produce the desired effects, the difficulty of obtaining natural plant hormones or auxins explains the fact that all growth regulating substances in commercial use are of synthetic origin. While substantial numbers of such compounds are available, in practical application only a comparative few find extensive use. According to Mitchell and Rice, (9) for example, the following are the most useful: indoleacetic acid, indolebutyric acid, indoleproprionic acid, naphthaleneacetic acid, phenylacetic acid, and naphthalene acetamide.

In a more detailed discusion, Zimmerman (6) divides the compounds into various groups, explaining that while these groups have different practical applications there is considerable overlapping in actual utility. In the group classed as naphthalene compounds, naphthaleneacetic acid and its derivatives are the most important and are used to inhibit buds, induce roots on cuttings and prevent abscission layers from forming (to prevent fruit drop). Of the indole compounds, indolebutyric acid appears to be the most valuable member of the group; serving mainly for propagating plants by cuttings. Several active substances are included in the naphthoxy compounds. Among these, beta-naphthoxyacetic acid and its higher homologs are useful to induce adventitious roots, cause modifications in plant organs, and induce seedless fruits.

By Milton A. Lesser

AMONG the newer compounds are those grouped as substituted phenoxy compounds. Receiving growing attention, they are now proving to be among the most effective of all growth substances. To this group belongs 2, 4-dichlorophenoxy acetic acid, better known as 2, 4-D. Publicized as a potent weed killer, this compound is a valuable plant hormone with important potentialities for inducing seedless tomatoes and for other plant regulating applications.(10)

Though not so thoroughly investigated, the group of compounds classed as substituted benzoic acids offers promise as a source of useful compounds, some with more or less specific uses. Newer plant hormones, including benzoic acid and phenoxyacetic acid derivatives, have been described in the patent literature.(11,12)

Only minute amounts of the synthetic hormones are needed to produce the desired effects; the concentration often being expressed in parts per million (p.p.m.). It must also be remembered, however, that the concentration of the growth of the substance and the duration of treatment will vary, not only with different plants, but also in many cases with different parts of the same plant. Such factors as season, temperature and the type of diluent or carrier are also very important. Although many of the compounds have been used in the form of their acids, for practical purposes they may also be applied as salts, esters or amides. It has been found that wherever a given acid is effective, its derivatives have approximately equal activity. Hence on the basis of difference in solubility, volatility, availability or ease of application, one compound may be preferred to another for a particular use. Thus, salts and acids are preferable for making aqueous solutions, while the more volatile methyl or ethyl esters are better when the hormone is to be applied as a vapor or aerosol.(6)

Plant growth substances may be applied as aqueous solutions, emulsions, fatty pastes, dusts or as vapors. To make aqueous solutions, often all that is needed is to dissolve the active substance in the appropriate amount of water. With some sparingly soluble compounds, enough may be made to dissolve to give the requisite action, because only small amounts are needed to induce plant responses. In other cases it has been found feasible to dissolve the chemical in a small quantity of alcohol and to add this alcoholic concentrate to the requisite quantity of water. This procedure has been suggested (9) for bringing idoleacetic, indolebutyric and naphthaleneacetic acids into solution.

The same principle has been used in a patented method (13) for making concentrated hormone solutions, which when diluted with water are used as root growth stimulants in the propagation of plants. Other patents (14) indicate that any one of several other solvents may be used similarly for making concentrated compositions for treating plants. In one case,(15) a hydrophilic colloid, like starch or bentonite, is used as a means of making aqueous suspensions of naphthalene acetic acid. Other interesting modifications for making aqueous solutions are mentioned in patent sources.(16)

Aqueous solutions of plant hormones may be applied by spraying, by soaking various parts of the plant in the fluids, or by watering the soil or other medium in which the plants are growing.

Emulsions find frequent advantageous use in applying plant growth regulators. Johnson,(17) for example, has reported that aqueous solutions of alpha- and beta-naphthoxyacetic acid were less active in inducing plant responses than were the same concentrations of the chemicals in lanolin paste or emulsions. Lanolin is often used in making emulsions for such purposes. A typical formula of this type of combination calls for the use of:(9)

After years of research, plant hormones are today a reality, lending valuable aid to agriculture in controlling plant growth, development.

Growth regulation substance	0.30 mg.
Lanolin	5.00 Gm.
Soap flakes	5.00 Gm.
Agar	0.25 Gm.
Water	100.00 cc.

The lanolin is melted and mixed thoroughly with the growth regulator to form a paste. The agar is dispersed in the previously heated water and then the soap is added. The mixture is heated and stirred thoroughly to form a smooth emulsion and finally enough water is added to make a final volume of 1 liter. The amount of growth substance is not fixed, but varies according to the purpose for which it is intended. Lower concentrations are often effective for treating blossoms or fruit, while stronger mixtures are more suitable for treating cuttings. Of course, materials other than lanolin may be used and other emulsifiers may replace the soap.(18,19)

Lanolin is also a favored paste base for incorporating 1 to 2 per cent of a growth-regulating chemical.(9) Pastes of this sort facilitate application of the hormones in experimental work, and also have found varied applications in practical hormone treatments. However, it may be noted that petrolatum-based pastes for stimulating root growth have been patented abroad.(20)

Dusts, prepared by dispersing the active regulating chemical in talc or other finely pulverized inert materials, are widely used for treating seeds, cuttings, roots and other parts of plants. Means for assuring even dispersion of the plant hormones are essential and ways to improve the efficacy of the dusts have been suggested.(21)

Another procedure for disseminating plant hormones, particularly useful for treating greenhouse plants, consists of vaporizing the active agents by means of a hot plate arrangement.(10,22) A variation of the vapor method, and one which may very well replace it, is the more recent adaptation of the aerosol spray, originally developed for insecticidal use. As with the vapor method, an entire plant may be exposed to the effects of the aerosol spray. However, one advantage of the aerosol is that with the use of a special cylinder or "bomb" it is possible to direct the active material on a particular flower cluster of the like without greatly affecting the other parts of the plant. In the first experiments (23) with this procedure 3 Gm. of naphthoxyacetic acid were dissolved in 27 Gm. of cyclohexanone. This solution was placed in a steel cylinder into which 270 Gm. of di-methyl ether was then forced under pressure. Other modifications have been developed by other investigators.(10) Growth substances dispensed as aerosols appear to be more effective than aqueous solutions. Offering economies in material and labor, this method has proved its efficacy in inducing seedless tomatoes and may provide a very efficient means of applying growth substances to plants for the purpose of modifying development, such as delaying opening of buds and preventing abscission of flowers and fruit.

In the interest of economy and efficiency, it has long been common practice to combine two or more plant treating materials in one preparation. From the technical and patent literature, it is quite apparent that plant hormones can be used in such combinations or in methods for overcoming or controlling the injurious effects of various other special treatments. Of interest in connection with this last is the work done by Grace (24) nearly a decade ago. He found that the addition of plant hormones to preparations for disinfecting seeds greatly reduced or prevented damage from formaldehyde solutions and copper sulfate and mercuric chloride dusts. The feasibility of this idea was emphasized by Nicol (25) who advocated its wider application. More recently, Wark, (26) reported that both alpha-naphthylacetic acid and beta-indolylacetic acid ground into dusts containing ethyl mercury phosphate partly restored the loss of germinating power produced on wheat seed by dusting them with the fungicide alone. Others have obtained similar results with hormone-fungicide combinations (27) and such preparations have been detailed in patent specifications.(28)

Part II of PLANT HORMONES Appears Next Month

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Effect of soil and fertilizer on growth and character of crops... how little we really know on this important subject

By Dr. Alvin J. Cox
Retired Chief of Bureau of Chemistry, State of California

ABOUT 300 years ago Johan Baptista van Helmont, a citizen of Brussels, conducted his classic experiment, the report of which has been translated into many languages, wherein he planted a willow shoot in 200 lbs. of dried soil and watered it only with rain water and in five years it grew to a 164 lb. tree. In the end he dried the soil once more and recovered the same 200 lbs. with which he started, less about 2 ounces, and concluded that the growth of the tree came entirely from the water. Since the air which surrounded the tree had no apparent weight, it was inconceivable to Helmont that the 164 lbs. of substance constituting the increased weight of the tree had any other source than that of the water applied to the soil.

As farming progressed, men discovered that soil fertility is the result of moisture, air, sunlight and other factors working together. Although nature had not done a bad job, they accidently learned ways to treat soil to produce a more luxuriant growth. On the advice of the Indians, the Pilgrim Fathers put a fish in each corn hill and discovered that plant growth was stimulated, although they did not know, as we do, that fish contain nitrogen, oxides of phosphorus, and potassium, essentials to plant health and growth. Thrifty farmers everywhere plowed deeply, spread manure on the ground, grew cover crops, rotated their plantings and used other useful practices they had discovered.

The effects could be measured but the causes of their effectiveness were not so readily determined. For example, while it was recognized that bones are beneficial on grass, the credit was given to their oil content and for that reason the bones of fat cattle were especially prized. The good results from the use of rape seed cake and from the residues of seeds of various plants likewise were attributed to their content of oil.

The science of agriculture was finally developed and went forward rapidly in the latter half of the 18th century with the beginning of chemical science, the development of which was fundamental to an understanding of the processes of plant and animal growth. It was not until 1840 that von Liebig suggested the mineral theory of plant food. We in our time realize the importance of available nitrogen, available phosphoric acid and water soluble potash. Depletion of these by heavy cropping, leaching through irrigation and other intensive farming practices, is so rapid that they need be regularly replaced to maintain normal production. In a general way 0.1 per cent of any of these is a dividing point between good and marginal lands, although climate and other soil factors may modify this value materially. We know also that sulfur, calcium, magnesium and iron are essential in considerable quantities to the growing plant.

The micro-nutrient elements, sometimes referred to as minor elements, manganese, zinc, copper, boron and molybdenum are regarded as essential in soil because of their

need in very small quantities by the plant. Micro-nutrient elements are usually sufficient for many years unless there is excessive leaching. There are reliable references such as "Hunger Signs of Crops" that enable experienced persons to recognize starvation symptoms. When these occur, they are to be corrected by special application of the particular elements needed, in the proper amounts required and not by impurities in a commercial fertilizer. An excess amount of some element may be injurious and detrimental, and no doubt plants tolerate other elements that are useless.

Complicated Soil Problems

AT ONE time many chemists believed that it was important to know only the chemical analysis of each type of soil, and from the analysis calculate the type of fertilizing material to apply. Thirty-five years ago in the *Philippine Journal of Science*, in a paper entitled "Philippine Soil and Soil Conditions," I stated that, "Many attempts have been made to classify and to explain the relative productivity of soils according to the results of chemical analyses, but the problem is too intricate; often the percentage of the various constituents bears no relation to the crop producing power, for the chemical composition is only one of many factors involved in the soil problem." My experience has been mostly in the West, but it is my belief that this is still true even when analyses are performed competently by skilled persons using recognized methods in a well-equipped laboratory. Furthermore, no analysis is better than the sample analyzed. To obtain a representative sample of soil from a given area is frequently very difficult.

The tests designed for use in the field to determine easily soluble potash, phosphoric acid and other nutrients may be very misleading. The methods employed are usually empirical and varying results are obtained depending on the method used and the kind of soil examined. (cf. U. S. Department of Agriculture, Misc. Publication *259*, 1937.) If these rapid chemical tests are useful at all, it is in conjunction with knowledge of previous plot experiments or of the response of the particular soil type in a given region to application of known amounts of specific fertilizers.

Chemical studies are very necessary to the investigation of soil problems, and many researches utilizing chemical technique are in progress at the national laboratories, federal-state experiment stations and elsewhere. Chemical data do explain general types of reactions between soils and fertilizers, such as the fixation, a locking-up, of phosphorus and of potassium, and provide suggestions for laying out careful field experiments and for making controlled pot experiments. Always the final basis of judgment of the effects of fertilizer additions to soil is the response of the crop itself.

Where there are acid soils in the southeastern portion of the United States and other regions of great rainfall, leaching of soils is liable to occur and deficiencies of magnesium, manganese, copper, and zinc have been common as the lighter soils came into general use. It is doubtless possible that spraying in some areas with, for example, Bourdeaux mixture applied for other purposes has automatically corrected what otherwise might have appeared as a copper deficiency. Where there is an actual manifestation of deficiency in a leached soil, periodic addition of the ingredient is desirable.

Complexity of the fertilizer problem in the West is far greater than in most other states, because of the great diversity of crops, soils, and climate, and of the brief period of development of western agricultural experience and knowledge of crop responses to fertilizer applications. Most western soils are sufficiently provided with micro-nutrient elements, and a soil when slightly acid with pH range between 6 and 7 generally best yields its food ingredients to plants. Many arable soils in the West tend toward high alkalinity with a pH of 8 or more. Some agricultural crops will tolerate and flourish in a somewhat alkaline soil, but in such soils the tendency is toward fixation of certain plant food elements by zeolites or other ingredients of soil. The plants may be benefitted by fertilizers that would be unsatisfactory for use on acid soils. As it affects the ability of soil to nourish plants, fixation is little different from leaching. The plant shows signs of deficiency. In such cases additions to the soil are of no avail for the added element also becomes fixed, but additions of elements such as zinc have been successfully delivered to plants showing zinc deficiency through spraying the dormant trees or leaves. Signs of deficiency of zinc are difficult to differentiate from those of manganese. If spraying with a zinc compound does not correct the symptoms, then there may be manganese deficiency.

Need For B_1 Questioned

THE popular extravagant enthusiasm for Vitamin B_1 occurred during 1942. There is no evidence that its application to chlorophyll-producing plants is of general value. Negative results of many published and unpublished experiments with Vitamin B_1 application under practical conditions have failed to bear out claims and statements widely spread at that time. Accordingly it is apparent that any claim that it is of value in a commercial fertilizer is *mis*representation. Claims for Vitamin B_1 in such a product have been largely discontinued as they are wholly discredited. In like manner so-called inoculated materials are taboo, for materials become inoculated as soon as they are mixed with soil.

Many shortcomings of plants, now known to be due to attacks of insects, for example, phylloxera on grapes; fungi, for example, strawberry dwindle; or other organisms, were formerly attributed to soil deficiencies. The selection or development of resistant plant varieties has in many instances solved these problems.

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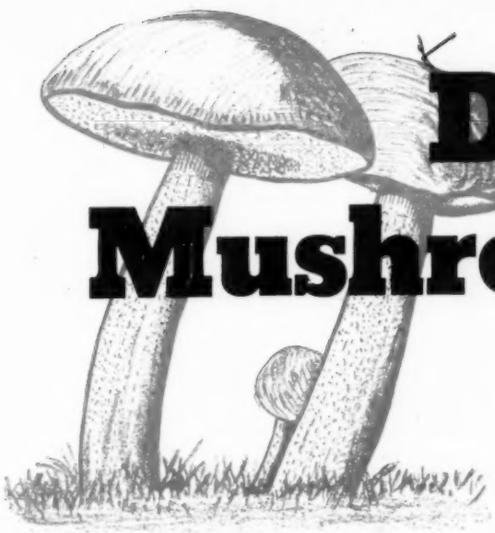


DDT In Mushroom Culture

By Dr. B. B. Stoller
Midwest Food Processors
Duluth, Minnesota

IN the course of experimentation on synthetic composts for mushroom culture at the University of Wisconsin in the winter of 1944-45, the crop became seriously menaced by the mushroom fly (*Sciara* spp.), even though the composts had been properly heated to control this insect. Entry probably occurred from adjoining greenhouses, rather than from out-of-doors, since outside temperatures were below freezing. After harvesting for two months, over 60 per cent of the mushrooms being picked showed injury by these flies, and many were unmarketable. Spraying the beds with nicotine sulfate or with a mixture of rotenone and "Lethane 60" (Concentrated Plant Spray — Sears, Roebuck & Co.) failed to keep the pest under control. After two months the growing room and mushroom beds were dusted with DDT—with amazingly good results.

A 3% DDT dust ("Gesarol")* was used. One pound of the powder was applied in the air and over the beds with a hand duster in a growing room of approximately 2,000 cubic feet. All the mushrooms had previously been picked except one box. This particular control box contained mushrooms in all stages of development and was given a heavy application. Flies were observed flying through the dust while it was being applied. Twenty-four hours later not a fly was observed on the wing, but some were attracted to a lighted bulb held near the soil surface. Maggots were also observed on the surface, although normally they remain under the soil. Some of the flies crawling on the surface lacked wings, and others had diminutive wings. The flies with normal wings were unable to fly when they were blown or pushed; and when they crawled over the edge of the box they fell to the floor.

The mushrooms dusted with DDT grew normally and caused no observable ill effects when eaten. Of a large crop harvested eighteen days after dusting, only 11% was infested by maggots. Furthermore, the maggots present were in the lower parts of the stems which are cut off when mushrooms are marketed. Twenty-six days after the first application of DDT and eight days after a second dusting, the number of infested mushrooms was reduced to only 2.5 per cent. The mushrooms were now growing in clusters instead of singly; they also weighed more and had thicker stems and caps. Furthermore, there were only a few dead mushrooms in the pin-size stage. In comparing the appearance of the mushrooms before and after dusting, it appeared that the production of mushrooms with long, thin stems and small caps had been caused by the large insect population which had reduced the supply of nutrients to the developing mushrooms.

Fifteen days after dusting, the flies became more numerous and now were observed climbing over the mushrooms, but few were observed on the wing. When the beds were sprayed with water a few days later the flies became much more active and similar activity was observed after subsequent waterings. Mushroom beds are usually watered every two to three weeks, after the mushrooms have been picked and the beds cleaned. It appeared that the lime in the casing soil reacted with the DDT when the beds were watered, and this reduced the toxicity of the DDT. The procedure adopted was to dust the beds with DDT one day after watering, so as to allow the beds to dry a little on the surface before treatment.

A characteristic of DDT not observed with other insecticides was the power to draw the maggots to the surface of the soil—in some boxes as many as ten maggots to the square inch. The maggots were very sluggish, except after watering. DDT apparently did not kill the maggots —nor were they killed by spraying with nicotine sulfate at the rate of one ounce to a gallon of water. However, when they were sprayed with a solution containing one ounce to the gallon of the mixture of rotenone and "Lethane 60" they were killed, as was evident by the growth of mold over quiescent larvae twenty-four to forty-eight hours after spraying. The flies were apparently killed by DDT as

(*Turn to Page* 64)

* Supplied by Geigy Co., Inc., New York.

Tells AIF Assn to study field problems of farmers

Leonard urges industry to "get your shoes dusty"... Palm discusses need for dealer education ... Hill warns of new insecticide problems ... talk on delivered prices by Lamb ... Rohwer on insect control coordination ... urges uniform state laws

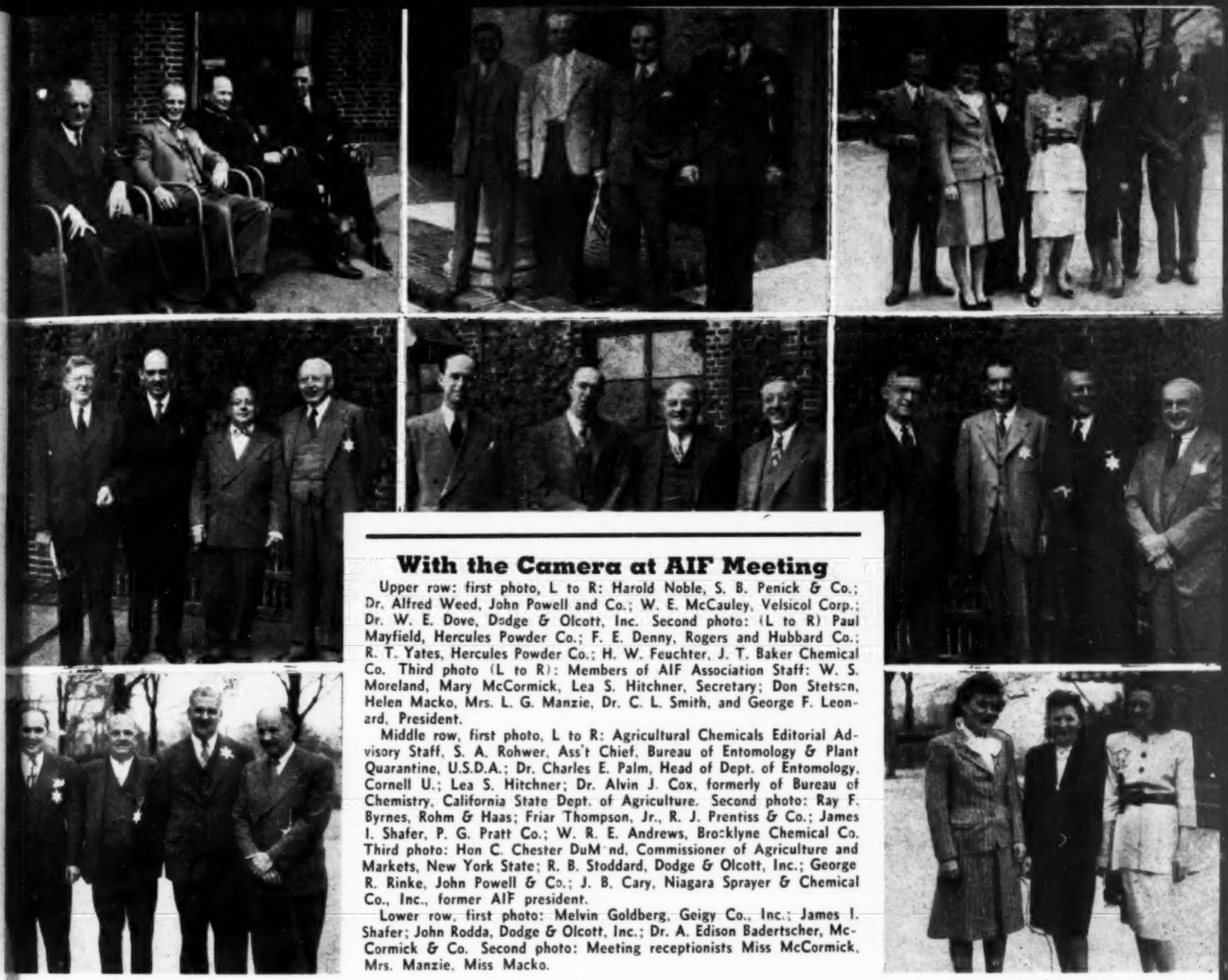
DISCUSSION of the need for education of the dealer as well as the ultimate user of agricultural insecticides and fungicides, advice to the manufacturer to "get his shoes dusty" out in the field with the farmer, a warning of the potential problems in the numerous new products coming on the market, a call for uniform state insecticide and fungicide legislation, and the recognition of the vitally important position in which the manufacturer of agricultural chemical products finds himself today, highlighted the semi-annual meeting of the Agricultural Insecticide & Fungicide Association on April 25 and 26 at the Westchester Country Club, Rye, N. Y.

AIF President George F. Leonard of Tobacco By-Products & Chemical Corp. sounded the keynote of the meeting in his opening address by reminding the industry that its immediate job is not one of making profits, but rather of acting as a public service association. "We must gear ourselves to hard work, integrity and responsibility," he said, in order to maintain a high level of food production in this country. He stated that the association is in the spotlight, and with the public eye on its activities, every member must do his part: "We must serve the end man in agriculture . . . the grower, the fellow who works out where it is dusty," he declared. To men of management he suggested that they leave their offices as frequently as possible and "get your shoes dusty" by visiting the farms and vineyards where food is produced; by talking to the actual user of agricultural products and discussing with him his problems. "The end man," he said, "the product user, is the one on whom our business is built. Learn from him. See him and talk to him."

Mr. Leonard discussed briefly the history of the AIF association, pointing out how in 1941 the association abandoned all side activities and settled down to the serious business of helping win the war through backing agricultural production to the fullest extent. "We are still facing a serious emergency of world-wide scope," he warned. . . . "We are still challenged by conditions brought about by war, and our job of assuring survival of growing plants is of utmost importance. . . ." He also pointed out that many factors mitigate against getting the job done. "Instead of production lines in industry, we have picket lines at our raw material sources . . . and other conditions tending to hold up materials necessary for agricultural production." The president went on to thank the committees at work on various problems confronting the association, and to pledge full interest in the activities of the industry.

Lea S. Hitchner, executive secretary of the association, presented to the group his report, revealing an increase in the scope of association activities, and telling how publicity regarding its work had spread into the remote corners of the world. He cited letters of comment coming from distant points, indicating an interest in the AIF, its aims and accomplishments as well as methods of handling various problems confronting the trade.

A report of the traffic committee was made by Chairman E. C. McClintic, who reviewed the work of the group through the past several years, pointing out how during the period of 1935 to 1941 freight structures were modernized to expedite shipments of economic poisons in all forms. He recommended that the work of the traffic committee in this regard be resumed, and pointed out to his hearers the possibility of increased rates soon to coincide with higher wages demanded by railway workers of the nation. He stated that traffic committee members must be alert and aggressive, "on their toes," working hand-in-hand with the industry in solving problems related



With the Camera at AIF Meeting

Upper row: first photo, L to R: Harold Noble, S. B. Penick & Co.; Dr. Alfred Weed, John Powell and Co.; W. E. McCauley, Velsicol Corp.; Dr. W. E. Dove, Dodge & Olcott, Inc. Second photo: (L to R) Paul Mayfield, Hercules Powder Co.; F. E. Denny, Rogers and Hubbard Co.; R. T. Yates, Hercules Powder Co.; H. W. Feuchter, J. T. Baker Chemical Co. Third photo (L to R): Members of AIF Association Staff: W. S. Moreland, Mary McCormick, Lea S. Hitchner, Secretary; Don Stetson, Helen Macko, Mrs. L. G. Manzie, Dr. C. L. Smith, and George F. Leonard, President.

Middle row, first photo, L to R: Agricultural Chemicals Editorial Advisory Staff, S. A. Rohwer, Ass't Chief, Bureau of Entomology & Plant Quarantine, U.S.D.A.; Dr. Charles E. Palm, Head of Dept. of Entomology, Cornell U.; Lea S. Hitchner; Dr. Alvin J. Cox, formerly of Bureau of Chemistry, California State Dept. of Agriculture. Second photo: Ray F. Byrnes, Rohm & Haas; Friar Thompson, Jr., R. J. Prentiss & Co.; James I. Shafer, P. G. Pratt Co.; W. R. E. Andrews, Brooklyne Chemical Co. Third photo: Hon C. Chester DuMond, Commissioner of Agriculture and Markets, New York State; R. B. Stoddard, Dodge & Olcott, Inc.; George R. Rinke, John Powell & Co.; J. B. Cary, Niagara Sprayer & Chemical Co., Inc., former AIF president.

Lower row, first photo: Melvin Goldberg, Geigy Co., Inc.; James I. Shafer; John Rodda, Dodge & Olcott, Inc.; Dr. A. Edison Badertscher, McCormick & Co. Second photo: Meeting receptionists Miss McCormick, Mrs. Manzie, Miss Macko.

to transportation and distribution of products of the industry.

Sanford J. Hill of E. I. du Pont de Nemours & Co. related some of his experiences in traveling through many states to discuss the labeling of DDT insecticides with various government officials. He stated that the tour had but one object: protection of the public. His observations led to the conclusion that state officials in some cases could not be blamed for issuing hasty and stringent legislation to combat unscrupulous fly-by-night concerns interested only in making as much money as possible from a gullible public, regardless of possible ill-effects from use and handling of the products they were rushing to markets. However, a number of states are now modifying their original strict requirements on DDT labeling, and others are expected soon to follow the apparent trend. "California," he said, "is probably the only state which still requires a 'poison' label on DDT products."

Organic compounds coming into the picture are greatly different from the older standbys, he reminded the group. "Since these are different, they will require different labeling," he said. "They are in a new field . . . and too much is not known about many of these compounds." He indicated that the committee is going on with its labeling research and investigation to gain all the information possible.

Bringing to light much of the history regarding delivered prices and Federal Trade Commission activities in connection with them, George P. Lamb, Washington attorney, described present trends in delivered prices as leading to "competition through confusion." He pointed out how the FTC desires all prices to be on an f.o.b. mill basis, discarding all delivered price systems including the universal delivered price. He termed "ridiculous" the fact that persons chancing to live near a shipping point should have a price advantage over those geographically more remote, and condemned what he called "catch words" with which the FTC has attacked all forms of delivered prices at every oppor-

tunity. "Whenever two or more companies have similar prices, there is an almost immediate assumption of collusion by the FTC," he declared. These circumstances of similar prices arise from the economic law of competition, he said, and pointed out how a salesman always endeavors to know the prices asked by his competitors for similar items. "The FTC was set up to stop unfair competition," Mr. Lamb said, "and not to say how high or how low prices must be." He stated that unless business men take active interest in correcting inequities, we will have competition by confusion the country over.

A plea for getting more knowledge to "front line" dealers "who are responsible for 80% of insecticide and fungicide sales," was made by Dr. Charles E. Palm, head of the department of entomology, Cornell University. "The new and complicated picture in the pest control industry is making imperative a program of dealer education," he told the audience. "Dealers today are faced with a vast variety of new materials and a wide range of formulations of single materials, such as DDT," he pointed out. Confusion exists in the matter of dosages, proper uses and compatibilities to such an extent that dealers simply can not keep up with every development, particularly since in most cases the dealer is a merchant with many other items of merchandise to sell. In times past the sale and servicing of insecticides was a relatively simple matter for the average dealer, since but few insecticides and fungicides were stocked, but an "amazing contrast" exists between today's condition and those of former years. The present condition calls for a wide dissemination of information through the press, radio, and publications of industry and federal agencies. Teamwork between government and industry is helping the situation, he observed.

Continuing its sessions the following day, the AIF meeting was again opened by President Leonard, following which Dr. Alfred Weed gave a report on the activities of the technical committee. He reviewed the groundwork laid for the instruction of qualified students in various fields of agricultural insecticide and fungicide research and laboratory techniques, through the cooperation of Carl F. Wedell and Dr. Louis F. Pyenson, both of New York Institute of Agriculture at Farmingdale, L. I. Dr. Weed listed the courses of instructions and named additional courses to be given.

He indicated that members of the AIF may make available their laboratories to students to familiarize the latter with the variety of standard tests that are made on insecticides and fungicides. It was also noted that the Technical Committee has been "further amplified in number and representation so that at the present time most fields . . . in which our membership is interested are represented on the committee." Dr. Weed said that this means that any general industry problem can be handled through the committee.

Hon. C. Chester DuMond, Commissioner, Department of Agriculture and Markets, New York State, spoke on uniform state legislation in the field of insecticides and fungicides. The full text of his address appears elsewhere in this issue.

Dr. Paul D. Sanders, editor of *The Southern Planter*, the nation's oldest farm publication, made a strong plea for entomologists and crop experts to impart their knowledge to the millions of rural users of insecticides and fungicides. His talk also appears in full elsewhere in this issue.

As a climax to the meeting, Dr. S. A. Rohwer of the Bureau of Entomology and Plant Quarantine, U.S.D.A., spoke to the assembly on the necessity for cooperation in insect control. He warned the industry that the possibility of regimentation still stands as a definite threat and that "every bit of our ingenuity is needed" to thwart it. He recalled that upon termination of the war, the insecticide and fungicide industry looked hopefully ahead to a plentiful supply of arsenicals and other materials, but now, nearly a year after hostilities, we find our raw material supply short. Mr. Rohwer stressed the responsibility of the group in seeing that the limited supplies of agricultural chemicals are distributed where they will do the most good. He asserted that it is a matter of "great importance" that there shall be "no crop failures because the little material available was not put in the right places at the right time." He added that the industry is in the spotlight, and that it needs results rather than publicity at this time. "This year we will have to cooperate with each other, or face the alternative of more strict government control over the entire industry," he stated. He added that the government is willing to work with the agricultural insecticide and fungicide industry, but the latter must in turn show a disposition to work within its own group toward a common end.

New developments are coming up in the field, he said, and industry must be alert to them and cognizant of their significance. There must be advancement in application facilities of insecticides and fungicides, he said. New devices will be developed by people with "know how," and applied by persons with knowledge of proper techniques. As an example, Mr. Rohwer pointed out how the public assumed that since the U. S. Army used DDT with success, that anyone can apply the poison without trouble. "It must be emphasized," said Mr. Rohwer, "that we will have many new products" which the public may find difficult to use properly. He warned that we must not be misguided in assuming that a new insecticidal poison is safe because it may be used without mishap by experts. The public hasn't had the training that U. S. Army personnel is given in this line, he said.

On the lighter side, following the talks, delegates at the meeting engaged in a golf tournament, prizes for which were presented at an informal banquet held in the evening.

PEST CONTROL.....

A Problem of Promotion

By Dr. Paul D. Sanders*
Editor, "The Southern Planter"
Richmond, Virginia

IN order to present its message to a widespread audience, the agricultural insecticide and fungicide industry needs more friends among the editors and publishers of America. Pest control is a mass movement, dependent upon public acceptance. The masses of this country cannot be told the industry's story without the support of the press and radio. Unless there is a free exchange of goods, services, and ideals between the various groups which comprise a democratic society, this form of government becomes faulty and our economic machine bogs down.

Going through the extensive research laboratories of our great commercial concerns or visiting the voluminous agricultural libraries of our Land Grant Colleges and the United States Department of Agriculture, and then returning to the peaceful countryside to see a cross-section of correspondence received from a million rural readers of The Southern Planter, one is convinced that the pest control problem is not one of research—as important as that is—but one of promotion. The abysmal chasm of ignorance which divides what *you* know from what *they* know is appalling. Fame and fortune are awaiting the firm or individual who can bridge this disparity. And if it is to be bridged, a new yardstick of accomplishment in pest control must be adopted. We must withhold the acclaim and awards for new scientific discovery until its ultimate significance has been translated into practice.

In his great book, *The Life of Jesus*, written nearly 100 years ago, Ernest Renan summarized the teaching techniques of the lowly Nazarine in these words: "To conceive good alone is not sufficient, it must be made to succeed amongst men, and to accomplish this, less pure paths must be followed." We must sacrifice the technical for the practical, if we are to command the masses to our cause. We must dramatize and popularize scientific data if we are to sell it to the American people.

Columbus discovered America and died "Unwept, unhonored and unsung"; Americus Vespucius publicized it and the country was named in his honor—America.

It was a poet and not a business man who said that if someone made a better mouse trap the world would beat a path to his door, even if he lived in the woods. This was said, too, before the days of modern advertising. The mouse trap maker would have a long wait today, for even if the public started to his house, it would be sold better publicized and better advertised rodent remedies on the way. You might produce the greatest insect killer of all times, but unless you told the world of your new discovery, few would ever adopt your method.

In the past the insecticide and fungicide business has attempted to live largely on the crumbs that fall from the table of the Land Grant College and the United States Department of Agriculture. The volume of sales generated by their publicity has constituted a major part of your business. This, of itself, is a wonderful asset to the industry—a foundation upon which can be built an astronomical volume of promotion and sales.

* Before Agricultural Insecticide and Fungicide Association meeting, Rye, N. Y., April 26, 1946.

A survey in our territory was made recently, revealing that the average Land Grant College bulletin published in the Upper South was of only 3,000 to 5,000 copies. The average edition of a Farmers' Bulletin published by the United States Department of Agriculture runs from 15,000 to 20,000 copies. And a large part of these is allocated to Congressmen. There are over 6,000,000 farms in America. It is the responsibility of this industry, through publicity and advertising, to carry the essence of these bulletins to the ultimate consumer. If the public can be made pest control conscious through newsworthy publicity, a proper share of the business will come through legitimate advertising. Country people are intensely interested in the life history and control of farm pests. Yet very little of this information appears in the editorial columns of the farm papers. The farm papers collectively have some 16,000,000 rural circulation built on reader interest. Think what it would mean to get a series of good, authentic articles on farm pest control told 16,000,000 times in the country homes of America.

The farm papers are not carrying more of this informative material now because it is too technical. The editors are afraid of it in its present form. And no one in the industry has bothered to study the style of presentation for farm consumption. If one can talk, he can write; provided it is made brief. "Brevity is the soul of wit." It is also the life of prose. The story of Creation in the Bible was written in some 500 words. Yet, an entomologist may use 500 words trying to explain the difference between a bug and a beetle, only to succeed in the first paragraph in so befuddling the reader that he moves on to the next story. In moulding public opinion, or changing farm practice, a long verbose diatribe is as dead as a door nail. It is much harder to write a good short story than a long drawn-out novel. A famous French woman of letters once ended a message to a friend: "Please pardon this long letter, I haven't time to write a shorter one."

It takes time and effort to prepare stuff with a punch, stuff that people will read, but these suggestions are helpful:

1. Limit yourself to a given number of words.
2. Outline the salient points of the subject.
3. Hook them together with short, terse sentences. Be epigrammatic. When in doubt, use a period.
4. Write it in the first person. I came, I saw, I conquered.
5. Go over the manuscript and strike out half of your adjectives. More as you grow stronger.
6. If there are any sentences or phrases that especially appeal to you, strike them out. They mean more to you than to your reader.
7. Where possible, use illustrative material. Your story in pictures leaves nothing untold.
8. And, finally, whatever you do, use simple language. Call a spade a "spade," and not an instrument of manual husbandry.

The most quoted, paraphrased and plagiarized political utterance in the history of our Nation, Lincoln's Gettysburg address, contained only 24 words of three or more syllables. If there is a question as to the medium to be used in getting your message to the public, here is a simple answer: "Where it will be read by those you are trying to reach."

Members of industry should learn the names of editors and reporters in the community, county and State. Sell them on the program and publicity troubles will be largely overcome. Concentrate on getting material published, rather than on writing. The great curse of state college and U. S. Department of Agriculture publicity is that too much is issued and too little is ever published. It has been said that when one considers the volume of newsprint out of Washington these days, it is small wonder that the Administration is fostering a reforestation program. Finally, one caution is offered and it is hardly applicable to this group. Publicity is a two-edged sword — it cuts both ways. While it creates a demand for your work, it also demands that you work. It focuses public opinion upon you.

Insects annually nullify the efforts of a million men, doing nearly two billion dollars worth of damage. Plant diseases, though less dramatic, are equally destructive. Mankind's struggle down through the ages has been to get enough to eat. Starvation is rampant throughout the world. And the work of this industry, the protection of plants and animals from pests, is one of the great humanitarian movements to bring food, fibre and good health within the grasp of all. In the past, as now, pest control is making a noble contribution to the preservation of the American way of life. Through various educational and advertising programs this group is supplying the social cement that holds our democratic society together.

Few Serve Many Now

IN 1820, just 126 years ago, 90 per cent of the people in this country were farmers. Nine people on the farm were required to feed one living in the city. By 1900, only 42 per cent lived on farms. And today less than 18 per cent of the gainfully employed are working in agriculture. Yet, in the face of every conceivable difficulty—shortages of machinery, feeds, transportation and spray materials—they have set new production records for seven consecutive years. They have done it by hard work and sacrifice. There have been no strikes, no picket lines on the farm front. They have done it because the men and women who till the farms of America have had but one yardstick of service—to win the war in the shortest possible time and to preserve the peace.

By better farm practice—making two blades of grass grow where one grew before—we have released farm population to build our cities. There is not a city of 100,000 population in the United States that is maintaining its population by natural increase—the death rate is higher than the birth rate. They are looking to the outlying country for replace-

(*Turn to Page* 61)

Uniform State Legislation

By C. Chester Du Mond*

New York State Commissioner
of Agriculture and Markets

SINCE enactment in 1910 of the present Federal insecticide and fungicide act, there have been built up on that basic legislation a large number of laws and regulations, both Federal and State, covering the marketing of insecticides and fungicides. We now find ourselves in an almost impossible position if we wish to manufacture, label and sell poisonous materials needed for the use of food producers vitally interested in protecting their crops or other products from damage by insects or fungus. This confusion is increased by the fact that there is a great deal of overlapping authority of various departments of the government, all of which have their own laws and regulations applying to the economic poisons industry.

We are now going into a period when efficiency in industry will be paramount. All industry will be geared up for efficient and low-cost production. It would seem that the insecticide and fungicide industry must follow a similar program and that it is high time that attention be given to the clarification and codification of the many laws affecting you. The cost of production and distribution must be materially lessened and the price to the consumer held within reasonable limits.

We are also going into a period when continuing research will add to our list of required insecticides and fungicides a great many new and valuable products. Many of these chemical substances which have been developed during the war emergency are now being manufactured in quantity for civilian use. The results of these uses for many purposes have been widely publicized by writers who have capitalized, in some cases, on the desire of the public for sensational reading. The public is ready, as never before, to buy and to use new economic poisons. It would seem, therefore, that for the protection both of the public and reputable manufacturers our laws and regulations must be put in shape to meet the situation.

The new uses which research has developed for chemicals as weed destroyers would indicate that the manufacturing of herbicides should be included in any attempt at law codification. We have today chemicals developed for agricultural uses the very existence of which was not generally recognized a few years ago. These chemicals range all the way from the various oils used to destroy the weeds in rows of commercially-grown carrots to the 2-4-D used for the destruction of weeds and poison ivy. Poison ivy, by the way, we have found to be a real menace to persons brought from the cities for the emergency harvesting of fruits and vegetables on farms. Certainly there is a tremendous opportunity for unscrupulous manufacturers to produce herbicides which will not prove efficient or which will do definite damage when put into use in the field. The proposed Federal law, therefore, should, and I believe in its latest revision does, include the manufacture and sale of herbicides, which promise to come into extensive use in the near future.

A brief history of New York State legislation may be indicative of what we may expect in attempting to pass proposed Federal and State laws now in prospect. The original insecticide and fungicide law in New York State was passed in 1922, and is still on the statute books. The law is very brief, but it does provide that packages shall be labeled with the name of the manufacturer and a statement giving the percentages of all active, essential ingredients. The chief emphasis of the law is placed on the use of Paris green, which was once used extensively for controlling the Colorado potato beetle. Paris green has now been largely replaced by other materials.

The law also provides for samples to be taken of the different chemicals offered for sale which shall be analyzed and the results of the analyses made available to the Commissioner. No penalty for violation seems to be attached to the law, and it is assumed that the manufacturer could be prosecuted only under the general laws against misbranding. In 1932 a conference of experts from the Agricultural College and the State authorities was held to devise a law which would bring our present law up to date. This conference resulted in a quite comprehensive report, which was introduced in our State Legislature in 1932. I cannot find that any action resulted, although

* Before Agricultural Insecticide and Fungicide Association meeting, Rye, N. Y., April 26, 1946.

5 POUND AEROSOL BOMB !

Refillable—Economical

MUL-T-VAPOR

Dept. of Agriculture Patent No. 2,321,023

Capacity 750,000 to 1,250,000 Cubic Feet

Can be had with or without DDT

WITH 3% DDT	WITHOUT DDT
Where the use of DDT is recommended	When the use of DDT is NOT recommended

Both formulas approved by Dept. of Agriculture

Shown here is the New Five Pound Aerosol Insecticide Bomb Available for Commercial Use.

Suggested for Resale To: Greenhouses, Dairy Farms, Mushroom Growers, Private Estates, Ranches, Florists, Summer Resorts, Stock Farms and others, for control of numerous agricultural and household insect pests.

A number of good territories still open for distributors with setup for DIRECT sales to agricultural and commercial users. Income continues after original sale is made. Refill is a steady source of revenue. Write for further details.

EQUIPPED WITH HANDLE GRIP

WELL BALANCED

POWERFUL ATOMIZED MIST

READY FOR INSTANT USE

REFILLABLE AT LOW COST

LASTS 5 TIMES AS LONG AS AVERAGE BOMB

IMMEDIATE DELIVERY

EDCO CORPORATION

MANUFACTURERS OF MUL-T-PRODUCTS
AT NEWARK, DELAWARE

Laws covering economic poisons must keep pace with scientific advances to avoid confusion and obstruction of progress, says Commissioner DuMond.

legislation was introduced in 1938 which required licensing of brands, of insecticides and fungicides, including herbicides. This act failed to be approved by the Legislature, and a somewhat similar act was introduced in 1939, 1940 and in 1941.

It is understood that these bills failed to pass the several State Legislatures to which they were introduced, because of opposition from some manufacturers of fly sprays who did not wish to state the amount of active ingredients and the amount of inert ingredients in their products. The bill as introduced in 1941 provided for brand registration requiring a license fee of two dollars annually. It was not designed as a revenue-producing measure, and seemed to cover adequately the need for regulation. In my opinion, this or a similar bill which might be uniform in all the states is badly needed at the present time. This instance in New York State is cited to show that any change in the law will need the support of all reputable concerns.

The present bill before Congress—H. R. 4851, which has been amended and clarified, after consultation with the trade and others, to H. R. 5645—meets clearly and properly the need for Federal legislation in this field. It distinctly places the regulation and enforcement under the Department of Agriculture of the United States and the regulatory bodies of any state which may adopt similar legislation. It also authorizes the Secretary of Agriculture to cooperate with the several states, not only in enforcement work, but in securing uniform regulations. It is hoped that this legislation will be enacted into law at the present session of Congress. Such a law is long overdue.

Commissioners, Directors and Secretaries of Agriculture in the various states of the Union are interested in having similar legislation enacted in each of their states. This matter will have to be worked on by various groups and agencies, to make certain that a model bill is drawn which can command the support not only of food producers directly affected, but also manufacturers and those in the trade who will undertake to meet greatly increasing demands for insecticides and fungicides. The defeat of similar legislation in the past has been due to the fact that the opponents of such legislation were very vocal in their demands that the bills be killed, while the greater groups of people who would be benefited by the legislation did not take an active interest in properly supporting the measures. There are probably very few states where this procedure could not be reversed if proper interest were aroused.

Such a model bill should be prepared, whether or not the Federal legislation is passed; and the group to undertake this work is the Council of State Governments through its Joint Legislative Committee on Interstate Cooperation. This committee was formed before we entered the war, to correlate state legislation which would assist in the efficiency of government. Assemblyman Harold C. Ostertag, The Honorable Charles Breitel, legal secretary to Governor Dewey, and Lawrence Williams, Esq., as counsel, are members of the National Committee from New York State. The work that this committee has accomplished has been of such outstanding value during the war that the committee will remain in existence and continue its work. Through its connections, already established and functioning, this committee can present the proposed legislation to every state and subdivision in a most effective way.

So far as can be seen at present, there is no feature of the proposed legislation which should not be welcomed by food producers, manufacturers, and those in the trade. The best time, however, to bring any possible objections to the attention of all of us who are interested in this state legislation is before the legislation is introduced. It is strongly recommended that through the Joint Legislative Committee and the United States Solicitor General's Division of Federal-State Relations we arrange for the study by the various states of this law. This will insure a bill which can be actively supported against any opposition which may develop in our state legislative bodies. I understand that, while this has been an off year for state legislatures to meet, next year will see most of them in session. There is, therefore, some need for intensive work during the coming summer and fall months.

You are assured that the National Association of Commissioners, Secretaries and Directors of Agriculture is ready and willing to see that this legislation is given active support in our several states. By concerted action and individual action, our state regulatory departments can go a long way toward the final enactment of a bill which will clear up the confusion which has deterred the manufacture, sale and use of proper insecticides and fungicides.

Comments....

By Dr. Alvin J. Cox

This column by Dr. Cox will appear from time to time as a feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief of the Bureau of Chemistry, California State Dept. of Agriculture in 1932 and retired in 1945.

IN this column on agricultural chemicals, I wish to tie observations of the past with the present and the significance of the past with the future in which we all have faith. I think it interesting to know about items that have developed law or made laws necessary.

Some time ago, an applicant for registration of an economic poison in California, in response to the question as to against what his product was effective, responded, "I don't know, I only want to sell it." It is needless to say that he had to develop satisfactory evidence of usefulness. I have in my possession an eight-ounce bottle of a very dilute only slightly colored water solution of lime-sulphur which it was proposed to sell for $1.50 for placing in the drinking water of poultry to kill lice and fleas or drive them away so they would never return. The theory was that the birds would exude sulphur odor through their pores, ignoring the fact that anatomists claim fowls have no pores. A fertilizing material in one state was ballyhooed as effective against all insects.

Did you ever know of a perfect law? Neither did I. In a democracy, almost all law is a compromise. When we find a law that appears workable, we endorse it, try it, and improve it as time goes on. Owing to progress, a law may need some changes and unless kept up to date. it becomes less acceptable. Let officials have authority, but if they are inefficient or if they make unwarranted interpretation of the law for their own advantage or to foster some unreasonable pet idea, then is the time to let yourself be heard.

The proposed Federal Insecticide, Fungicide, and Rodenticide Act, Sec. 2, t, (2), (d), states, "For the purposes of this Act—the term 'misbranded' shall apply — to any economic poison—if the label does not contain a warning or caution statement which in the judgment of the Secretary may be necessary and adequate to prevent injury to living man and other vertebrate animals, vegetation, and useful invertebrate animals." It is the manufacturers' moral responsibility and to his best interest to safeguard the public health.

In addition to what has been done by various official agencies, the Manufacturing Chemists' Association of the United States in 1945 issued "A guide for the preparation of warning labels for hazardous chemicals" (Manual L-1). Therein it is stated. "The development of new chemical products and the introduction of chemical processes into ever-widening fields has accentuated the need for furnishing appropriate information in those cases where special precautions are necessary. Many chemicals present no hazards in normal handling and storage and for these products no precautionary labels are necessary. The education of employees regarding chemical hazards is, and must remain, the direct responsibility of their employers. However, such hazards are not confined to employees alone, and information concerning them should, so far as practicable, reach every person using, transporting, or storing chemicals. The most practical means for the seller to disseminate this information appears to be by labels affixed to containers of hazardous chemicals, bearing appropriate precautionary statements and instructions stated as simply as circumstances permit." In the Guide are given general principles, definitions, and recommended label cautions.

The Manufacturing Chemists' Association regarding formaldehyde solution has issued the warning (Manual Sheet SD-1) that it causes irritation of skin, eyes, nose, and throat, and recommends avoidance of prolonged or repeated contact, prolonged breathing of vapor, and use of adequate ventilation. Under the heading, "Hazardous Properties," among other things, they warn that ". . . It may act as a sensitizer and produce acute dermatitis and hypersensitivity in some susceptible persons. In fact, a single severe irritation of the skin may be followed by unusual susceptibility so that a worker can no longer work in an atmosphere containing even small traces of formaldehyde." It would have been difficult to imagine a manufacturers' association saying this a decade ago. It is gratifying when reputable manufacturers assume responsibility to pass out facts and truth to everyone.

Few people have trouble with

(*Turn to Page* 61)

Fertilizer Outlook

By Kenneth D. Morrison

THE 1946-47 fertilizer outlook in the United States and the world was discussed at length in a recent meeting of the Fertilizer Industry Advisory Committee held in Washington at the request of L. B. Taylor, U. S. Department of Agriculture vice-chairman. Clinton P. Anderson, Secretary of Agriculture, addressed the group on the importance of fertilizers in meeting requirements for increased farm production in the world food situation, emphasizing the need for fertilizer in world markets.

Facts and figures brought out at the meeting included those connected with the world fertilizer situation, United States requirements for 1946 and 1947, supplies of fertilizer materials available, and a review of the situation in view of labor and raw material difficulties.

The world fertilizer situation was seen as likely to experience many shortages throughout the year. An over-all shortage of nitrogen is estimated to be about 10%; of phosphate rock, about 2,000,000 tons. Potash was seen as being at present in a very acute position, but with the likelihood of becoming easier at a later date. No potash is expected to be imported from Europe this year, since most European production appears to be consumed by agriculturists on the continent.

Fertilizer requirements in the United States for 1946 and 1947 are estimated to be around 800,000 tons of nitrogen; 1,850,000 tons of phosphoric acid (P_2O_5), and 800,000 tons of Potash (K_2O). Of these, nitrogen and potash programs may be some 100,000 tons each short of requirements, but the outlook for superphosphate appears brighter.

Regarding the supplies of fertilizer materials, it had been recommended by the Potash Producers' Industry Advisory Committee to the Civilian Production Administration that all potash materials be placed under government allocation. The reasons given for this recommendation cited heavy export demands, a generally short supply, and pressure in local markets. It was the opinion of the majority of the Fertilizer Advisory Committee that the Government should take over the allocation of potash materials, and this has now been done. (See Page 50-A.)

One of the two most important recommendations made by the committee was that the government restore operation of its own sulphuric acid facilities in order to provide a sufficient amount of sulphuric acid for the production of superphosphate, particularly in the midwest. The other recommendation was that the Government, through government-owned sulphuric acid plants and nitrogen facilities, produce sufficient sulphate of ammonia for export, particularly to supply the large quantities requested for China and Japan.

The already short supply of sulphate of ammonia received a further setback because of a lack of coal due to labor difficulties. Despite the fact that fertilizer supplies failed to meet the demand, the season closes with most manufacturers finding it to have been one of the largest ever experienced. With the present food situation throughout the world, it is felt that the fertilizer industry of the United States will see at least two more years of peak production, during which there will be a brisk demand for mixed fertilizers and superphosphate.

Regarding the legal status of the Advisory Committee, information was requested from the Attorney General's office. In reply, it was indicated that as long as the Committee was advisory in character and represents the industry and does not promulgate or administer policies, its consultation with the United States Department of Agriculture does not violate the antitrust laws.

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DDT vs. Codling Moth

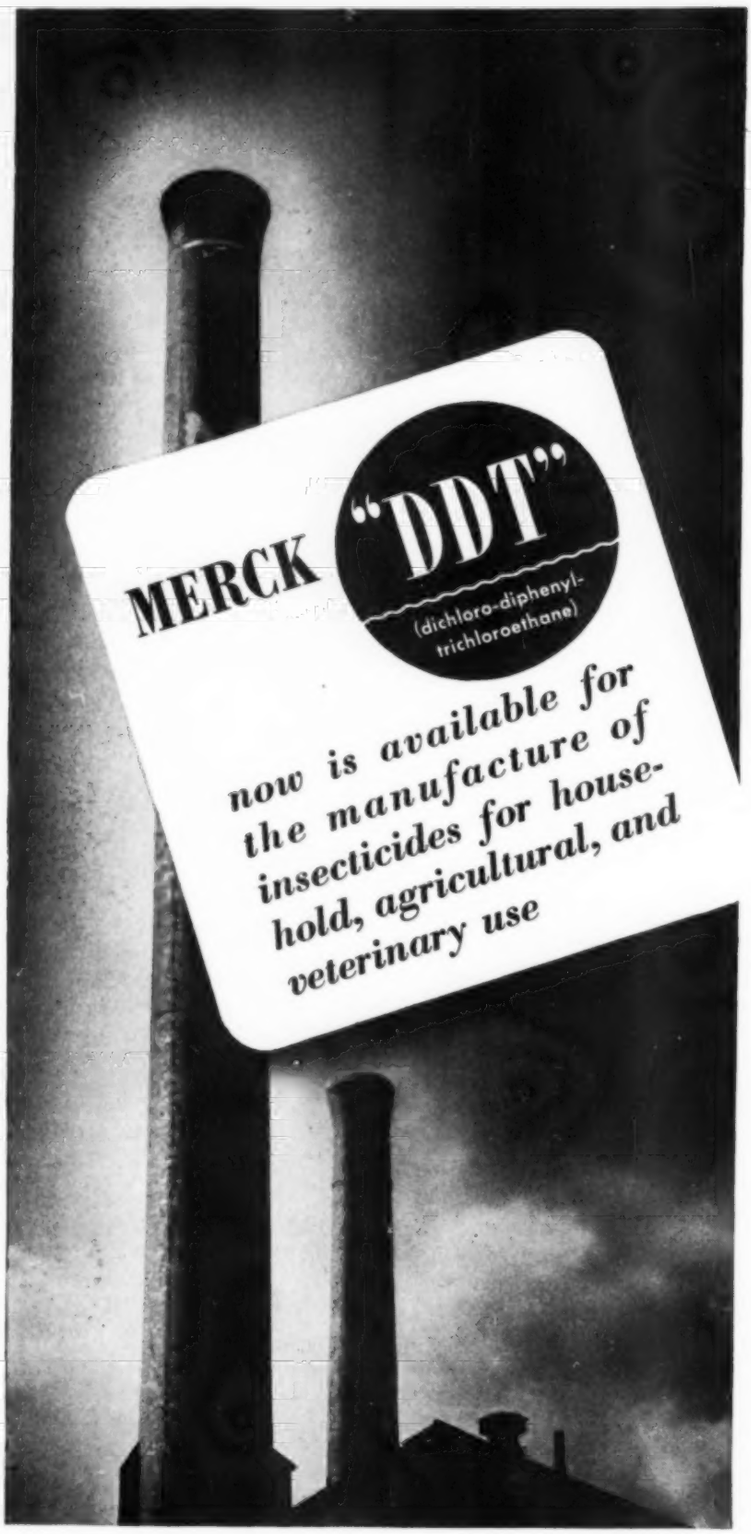
Prof. S. W. Harman, entomologist at the New York State Experiment Station at Geneva reports in a recent bulletin that two years' experiments with DDT for the control of codling moth on apples have indicated that this insecticide is "by far the most effective material ever tried against this pest." Prof. Harman warns, however, that much remains to be learned about dichloro-diphenol-trichlorethane, and that in cases where growers have controlled the codling moth with lead arsenate, this older method should be continued rather than turning to DDT. In cases where heavy sprayings with lead arsenate have failed to control the pest, Prof. Harman states that the grower would be justified in adopting a DDT program.

Experiments showed that exceptionally clean fruit was obtained with three cover sprays for first brood codling moth and one August application for second brood worms. Many other apple insects seemed to be held in check by these applications, it was observed. The spray used was at the rate of one pound of actual DDT in 100 gallons of water. The only serious disadvantage observed in these experiments was an increase of the European red mite as soon as the spraying season was over. This seems to be due to the destruction of the natural enemies of the mite, according to the bulletin.

•

2,4-D Stops Pollen Growth

Through use of 2,4-dichlorophenoxyacetic acid, scientists at the New York State Experiment Station report that areas infested with ragweed have been treated successfully to stop pollen growth. The spray contained only one-tenth of one per cent of 2,4-D.



NOW that its job of protecting the health of American Service men overseas is almost completed, Merck "DDT" Technical is being released to manufacturers for the production of modern, effective insecticides.

Expanding application defines more definitely the important rôle, present and future, of "DDT" in the hands of the insecticide manufacturer and pest-control operator. For many years, Merck has been producing the pivotal basic chemical employed in the synthesis of "DDT" and thus it was only natural that we should be at the forefront in the production of this powerful insecticidal agent.

The product we are offering is—

"DDT"

(dichloro-diphenyl-trichloroethane)

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As production levels rise and current commitments are provided for, we will find increasing opportunities to co-operate with manufacturers of "DDT" insecticides and to serve as a basic and prime source of supply for this product.

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Experiment Station Digest

By H. H. Slawson

DATA from various state experiment stations reveal activity in many fields of agricultural research, as indicated by annual reports for 1945. Subjects covered by these reports include data on the potentialities of DDT in controlling certain agricultural pests; a report of measurement of chemical and physical properties of certain petroleum fractions; tests of chemicals for blossom thinning in fruit orchards, and studies of dinitro compounds.

The New York Experiment Station at Geneva has for several years been studying the measurement of the insecticidal efficiency of a group of narrow boiling petroleum oil fractions. These tests were extended in 1945 to include other insect pests toward which petroleum oils are particularly effective. While analysis of data on these fractions was incomplete, the brief progress report states that "Sufficient data on their composition are available to indicate that high paraffinic character of an oil is essential for high efficiency in the destruction of egg and other stages of at least ten insects."

The report refers to the interest oil companies and dealers are showing in supplying oils of high efficiency for dormant and semi-dormant sprays and asserts that the majority of oils offered for this purpose meet the station's tentative specifications. "The detailed studies on the relation of insecticidal efficiency of petroleum oil fractions to their chemical constitution are being supplemented by studies on the efficiency of synthetic hydrocarbons of known constitution," the report says. Although only a few such hydrocarbons have been synthesized and tested, results to date show the same high efficiency for high paraffinic character as was experienced in the case of petroleum oils. "When the work on the synthetic hydrocarbons is complete, we should be in position to define rather exactly the most ideal hydrocarbon composition for insecticidal purposes," it concludes.

Studying the problem of improving the fungicidal and insecticidal effectiveness of dusts, the Geneva station developed a light-weight, inexpensive machine designated as the "New York Spray duster," which applies a small amount of liquid to the dry dust as it emerges from the nozzle. The machine, it is claimed, "should be particularly useful in controlling diseases and insects on cherries, peaches and prunes, where ordinary dry dusting has proved ineffective."

The Massachusetts station at Amherst, in cooperation with Dow Chemical Co., continued during 1945 investigations started previously on use of DN-111 or D-4 for control of European red mite on orchard trees and found these products "very dependable." The report stated that in one of the experimental blocks in which tests were made with DDT as a replacement of lead arsenate, repeated applications of DDT failed to kill the red mites which by early June had increased to an average of 175 mites per leaf. DN-111 in one application reduced the population to 1.5 mites per leaf within 24 hours.

Applied to beach plums heavily infested with red mites, DN-111 and D-4 reduced the mites "almost to the point of extinction." Other evidence of satisfactory control was cited, leading to the conclusion that DN-111 can be expected to give a high degree of control and D-4 dust will give practically as good results.

The Idaho Experiment Station at Moscow investigated the use of caustic sprays for thinning blossoming fruit trees as a substitute for expensive hand-thinning. Results secured with peaches, prunes, apricots and cherries "have so far been inconclusive," states the report, but with apples "satisfactory thinning has been attained in several instances."

Where one pint of sodium dinitro cresol (Elgetol 30) was used in 100 gallons of spray on Rome Beauty trees, the fruit was slightly larger and the yields greater than on hand-thinned trees. Where 1½ pints were used per 100 gallons of spray, the apples were considerably larger with a slight reduction in yield over trees receiving the one pint treatment. The cost of the thinning operation was reduced by use of a blossom spray, the report stated. It adds, however, that there is no way of determining for all conditions just when a spray should be applied and what the concentration should be to assure the best results.

Pennsylvania State College experiment station workers investigated use of phenothiazine-lead arsenate for codling moth control, the work further confirming several previously noted advantages over other spray combinations for heavy infestations. "The phenothiazine-lead arsenate combination," says the report, "did not favor the rapid build-up of red mites, as did a DDT-lead arsenate and other combinations. Phenol-lead sprays also were as safe or safer than available alternates from the standpoint of foliage injury where heavy spraying was required."

With respect to DDT, the various station reports indicate both a "thumbs up" and "thumbs down" attitude, depending on cases and conditions. South Dakota station at Brookings reported an instance where effectiveness of the DDT spray lasted "fully fourteen months." Pennsylvania Station, on the other hand, declares in its report that "DDT has not proved as potent an insect killer as orchardists have been led to ex-

pect." In between these two extremes much clarifying data was massed during the year.

Regarding the South Dakota findings, the station report says: "The windows of a garage were heavily sprayed with a 3 per cent DDT solution. All windows were located on the north side of the garage and received no direct sunshine throughout the year. Flies of several species, including stable flies, house flies, several species of blue and green bottle flies, and others, found their way into the garage and eventually came to rest on the windows. The kill of the flies was practically 100 per cent. The effectiveness of the spray lasted fully fourteen months." At the South Dakota station a 3% DDT spray was used on ceilings, walls, stanchions and windows of two dairy barns. A power sprayer was used with pressure kept at 120 to 160 lbs. and surfaces sprayed were thoroughly dampened. One barn had walls and windows treated with whitewash, while walls of the other had been painted with linseed oil paint. Flies in both barns died rapidly following applications of the spray, but a marked difference was noted in the lasting effect. In the barn with painted walls, continues the report, "flies died for the remainder of the fly season, a period of 2½ months and in this barn no further application of the spray was necessary. In the barn whose walls had been whitewashed, the effectiveness of the DDT spray rapidly became less and less and after ten days the killing effect of the DDT was so slow as to be unsatisfactory."

South Dakota reported also on the use of a spray made by dissolving one per cent of DDT technical grade in xylene, emulsifying with "Triton" and diluting with water. This was sprayed on two lots of cattle which were kept in a pasture for the greater portion of the experiment. "Flies were killed by the treatment," says the report, "but the spray did not act as a repellent. Both stable flies and horn flies could suck a fill of blood before being affected by the spray on the cattle. The spray remained effective for approximately ten days, when it seemed advisable to repeat the treatment. It was concluded that not only must the cattle be sprayed systematically every ten days, but the fly-breeding areas must be eliminated. . . . No apparent damage to the cattle resulted from these experiments."

Important information on control of plant disease and insect pests is secured by more than 100 state experiment stations. Here is a report of work in progress at some of these stations.

"Excellent control" is also reported by the South Dakota station of cabbage worms, cabbage looper and flea beetles on cabbage, kohlrabi, cauliflower and broccoli from use of a one per cent DDT-talc and a 3 per cent DDT-talc dust in both large and small scale tests.

Colorado station at Fort Collins found DDT "quite effective" against adults and nymphs of potato psyllid. In a field-plot test plants treated with DDT produced at the rate of 104.27 bushels more per acre than did plants sprayed with liquid lime sulfur, the standard treatment generally used throughout Colorado. Using DDT on Mexican bean beetles, the Colorado investigators reported that the product in varied percentages of concentration "failed to give satisfactory control." Used on bean cutworms, however, DDT dusts and sprays "appeared to be the most promising control. Cryolite and basic copper arsenate were second and third." Results "significantly better than were obtained with fixed nicotine" were also reported from use of DDT on codling moths. Continuing, the report adds: "The difference between results obtained with DDT treatment and eight treatments involving arsenate of lead and various combinations of soaps and oils as spreaders and ovicides was very highly significant." The standard hydrochloric acid wash, it was decided "was not effective in removing DDT residue."

Pennsylvania station at State College, Pa., considered several new fungicides for control of apple rust and, regarding one organic fungicide not then ready for the market, the report states that it "has proved in every way equal to standard lime sulfur-bordeaux treatments." From one season's work Pennsylvania workers concluded that "it appears that DDT will control the grapeleaf hopper." It was also found that nicotine sulfate and "Lethane 72B" were quite toxic to the leaf hoppers. DDT and a proprietary material, "Z 39," showed high toxicity to mushroom flies but a warning was issued that "until more is known of their toxicity, they should not be sprayed over mushroom beds." Some 170 materials were tested as contact insecticides at the Penn station and it was found that

"several from the Eastern Regional Laboratory compared favorably in toxicity on a nicotine basis with commercial products."

The Massachusetts station conducted extensive tests of DDT in various forms, in cooperation with the Crop Protection Institute, materials being supplied by the Geigy Co., Inc., New York. "Gesarol A-20" and "A-3" gave "promising" results against rose chafer and "were fully as effective against Japanese beetles as against rose chafer." DDT was "very toxic" to striped cucumber beetles and also killed young-stage squash bugs up to and including half-grown nymphs. Later stages of the squash bug, however, "were quite resistant and adult bugs seemed to be only slightly affected." Gesarol A-20 "proved very effective" in control of black scale on gardenias, but, used against the plum curculio on apples, was "surprisingly ineffective." Use of DDT spray gave "almost perfect control" of European corn borer and, when added to standard bordeaux for application against potato flea beetles "did not give noticeable reduction immediately, but showed a cumulative benefit from successive applications which resulted in marked reduction in number of leaf punctures."

For control of onion thrips the Massachusetts report states that application of a dinitro dust ("DN-4") gave a reduction of 97.5% in thrips population but caused slight burning of plants. "Lethane (B-71)" dust gave 78% reduction with no injury and "Gesarol A-3" dust proved "only moderately effective" with a 44% reduction. Rechecking on use of chlor naphthalene mixtures as greenhouse fumigants, preliminary fumigation with alpha bromo naphthalene showed "reasonable" toxicity to the common red spider, but also gave indication of plant injury. However, the material was considered sufficiently promising to warrant further investigation. Other phases of the Massachusetts station's work last year deal with control of plum curculio in apples, control of cabbage maggots, red spider mites on greenhouse crops and squash vine borer. Results are reported on use of the Geigy products in the college piggery and on fly larvae in infested manure and on use of sprays to prevent infestation of elm logs by various insects.

Fight Pests in East

AT the East Wareham, Mass. Cranberry Experiment Station, investigations were conducted into use of sabadilla and DDT as possible controls of various cranberry pests, this work being done in cooperation with the U. S. Bureau of Entomology. Sabadilla, used as a 20 per cent dust, was fully effective against the black-headed fireworm at the rate of 75 lbs. per acre. At 100 lbs. it controlled the blunt-nosed leaf hopper, but at 100 lbs. it was wholly ineffective against cranberry fruit worm and killed only about two-thirds of the cranberry girdler moths.

Growers were reported as disliking sabadilla because of its sternutative effects on those handling it. Says the report: "This seems to be a fair stop-gap insecticide for the black-headed fireworm and blunt-nosed leaf hopper, but probably will never have permanent value as a cranberry insecticide." DDT in 3% concentration at 50 lbs. per acre proved fully effective against gypsy moth caterpillars and blunt-nosed leaf hopper. A 5% dust at 100 lbs. per acre was 80% effective against cranberry fruit worm, but, says the report, "was clearly less satisfactory than derris or cryolite." No evidence of plant injury appeared, but the report warns that the bee situation is such that is seems dangerous to advocate use of this material on cranberry bogs even against pests which it controls readily.

Maine blueberry growers will benefit from use of DDT for control of black army cutworms, the report of investigations of control measures at the Orono station indicates. In three separate areas where the cutworms were causing considerable injury, a number of insecticides were applied, including poison baits, calcium arsenate dust, cryolite dust, copper-lime calcium arsenate dust and a 3% DDT dust. "By April 17," says the report, "no further injury to blueberries could be found on plots treated with the 3% DDT dust and these treated plots were not noticeably re-infested by cutworms coming into the plots from other areas."

Pea aphid investigations at the Maine station produced evidence that the best control was obtained with a dust containing nicotine and rotenone, the percentage of control at the end of six days being 96.6. Other insecticidal work at Orono was concerned with aphid controls on potatoes, apple spraying with proprietary products, including "Fermate," "Puratized N5X" and a DN compound.

Because different chemical manufacturers have shown interest in development of non-copper fungicides for spraying potatoes, Maine investigators made a comparison of some of these new materials with Bordeaux and with basic copper sulfate. Plots sprayed with the non-copper fungicides yielded somewhat more than plots sprayed with Bordeaux and basic copper sulfate, but differences "were not great enough to be significant." No late blight rot was observed in plots sprayed with Bordeaux, while, in contrast, decay was present where the other fungicides had been used. Previous tests had shown that when rotenone was added to copper fungicides yield rate was increased on two varieties of potato, the Green Mountain and Sebago. Extending these tests further to the Katahdin variety, an increase of fifteen barrels or forty bushels per acre followed. This increase, says the report, was sufficient to pay the additional cost of the rotenone. A comparison was made of the relative ability of a number of different disinfectants to destroy organisms contaminating burlap bags which cause potato ring rot. Copper sulfate, at the rate of one and two lbs. in ten gallons of water did not completely destroy the organism, but it was completely destroyed when two lbs. of copper sulfate were added to a saturated table salt solution.

Coal tar dip preparations were "reasonably effective" bactericides at

(*Turn to Page* 56)

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Every day—every week—every year the "Black Leaf" line is always on the job serving agriculture . . . Briefly, here is this many-purpose group of products used by so many people for so many needs:

1. THE FAMOUS "BLACK LEAF 40"

Recommended by Federal and State Experiment Stations for many uses. These include a dormant apple spray for rosy aphid and bud moth. Also used in foliage sprays to control plant lice, leafhoppers, thrips, pear psylla, red-bug, leaf miners and similar small insects on trees, flowers, small fruits, ornamental plants, and greenhouse plants. Utilized in nicotine dust or in combination sprays, and is compatible with all other spray materials . . . Employed as a dip to control scab mites on sheep and cattle, and ticks on sheep. Very effective as a drench for stomach worm in sheep . . . A great time-saver in delousing chickens; spread thinly on the roosts with a Cap-Brush, the nicotine volatilizes at body temperatures, causing fumes to rise under the feathers.

2. BLACK LEAF 155

Developed particularly for cover spray control of codling moth. Leaves no harmful residue; no need to wash apples. Toxic to mature eggs, larvae and adult codling moths, young leafhoppers, summer aphids and leaf miners.

3. NICO-FUME PRESSURE FUMIGATOR

For greenhouse work. Carries Nico-Fume in a combustible medium which readily burns under pressure when ignited. Fumes spread where wanted with minimum losses.

Eliminates contact of hands with powder.

4. NICO-FUME LIQUID

For those who prefer to have their nicotine fumigant in liquid form for application to steam pipes. It may also be mixed with water and applied as a spray.

5. MASH-NIC

A standardized product designed to take the place of feeding tobacco dust. It is used for the control of large round worm (*Ascaridia galli*) in chickens. When mixed with the feed it gives outstanding results.

6. BLACK LEAF POWDER AND PELLETS

Large roundworm (*Ascaridia galli*) in chickens is controlled by feeding a little Black Leaf Powder mixed with the Mash. The product is inert until it reaches the intestines of the chicken where chemical reaction takes place. The nicotine is then released and destroys the worm. Chickens are not upset by this "shockless" treatment. The product comes in powder and pellet form as preferred.

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7. BLACK LEAF CUNIC DRENCH FOR SHEEP AND GOATS

Black Leaf is combined with Copper Sulphate in one container. It is based on a formula long recommended by State Experimental Stations and the U.S.D.A.

8. BLACK LEAF 155 WITH DDT

A prepared dry combination of nicotine and DDT for codling moth and certain other insects.

9. BLACK LEAF 10 DUST BASE

A specially prepared high-strength free nicotine dust base designed for remixing with other standard dilutents and insecticides. Meets the demand for a non-alkaline neutral dust.

10. BLACK LEAF DRY CONCENTRATE

Used for combinations for making a liquid spray or as a base mixture with a carrier for dusting.

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The Listening Post

This department, which reviews current plant disease and insect control problems, is a monthly feature of AGRICULTURAL CHEMICALS. The following comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey. The following summary of their most recent reports was prepared especially for this magazine.

By Paul R. Miller

THE development of blue mold disease of tobacco seedlings, since its first appearance in the United States, has been of continued interest and importance. As is well known to plant pathologists, blue mold was first found in this country in the shade tobacco area of Florida and Georgia in 1921. The disease was not observed again until 1931, when it appeared in the same region and this time spread as far north as Southern Maryland. In subsequent years the range has extended throughout most of the area of tobacco production. The rate of spread and the amount of damage has varied considerably from one year to another.

The disease appeared unusually early in many sections of the country this year. It reached its peak in the Tifton, Georgia and the Florida flue-cured area about March 10. Damage was considerable, probably as high as 30% of the plants killed, with a definite plant shortage reported in a few counties. Since many growers remembered that blue mold was not destructive last year, fewer than usual started early to control this disease this year. Consequently, when they decided they had better get busy it was too late.

In South Carolina it appeared about March 10 and weather conditions were favorable for its spread and development for a period of five weeks in some counties. Plant mortality was high, with 50 to 75% of the plants killed in many beds. In many cases, defoliation was severe and transplanting was delayed two or three weeks. The control method used most extensively in this are was dusting with Fermate dust. Growers who used this treatment had excellent results and were able to transplant their crops at the normal time. Approximately twenty tons of "Fermate" dust (15% "Fermate" in pyrophyllite) were used by tobacco growers in South Carolina.

Blue mold was observed April 6 this year in Virginia and a few days later in Maryland. In Kentucky the first infections appeared April 17 in the southern part of the state and by the beginning of May the disease was generally present throughout the State. The small size of the plants in the beds aggravated the loss from this early attack.

TOMATO LATE BLIGHT IN FLORIDA. In the Homestead area this season tomato plantings sustained the worst attack of late blight in recent years. Late blight first appeared in tomato fields during the first part of January, 1946, and within two weeks had affected approximately 90 per cent of the tomato plantings. Crop losses varied from a trace to total loss, with average ranging about 40 per cent.

As there had been no severe outbreak of late blight on tomatoes in the last few years, many of the growers had not started spraying and many more were not equipped to spray their plants. Many of those

(*Turn to Page* 59)

Insect Conditions During Early May

By G. J. Haeussler

This column is prepared especially for readers of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U.S.D.A. His observations, based on latest reports from Bureau field representatives all over the country, will be a monthly feature of AGRICULTURAL CHEMICALS.

OUR previous discussion of the more important insects requiring chemicals for their control reviewed the overwintering situation and, in general, development of the pests through the month of March. Let's take a look now at developments throughout April and early May.

Hatching of several of the more important kinds of grasshoppers has been under way in many western areas and in some places they have been feeding on range land in abundant numbers. Severe damage to alfalfa from grasshoppers was reported from southern Arizona. By the latter part of April, fairly heavy infestations of mormon crickets were present in some counties of northwestern Nevada, northern Oregon, southern and northern Washington, and considerable baiting had taken place.

The vegetable weevil appears to be more abundant than usual in parts of Florida, Georgia, and in the Gulf region from Alabama to Louisiana.

Overwintered adults of the chinch bug have been less abundant than for many years in Kansas. Early in April, light infestations were present in northeastern Oklahoma grain fields and in some cases the bugs caused light damage to early planted corn into which they moved.

The boll weevil has survived the winter in large numbers in South Carolina, Louisiana, and Texas and has been reported on seedling cotton in Texas, Louisiana, and Georgia.

The cotton fleahopper hatched about 3 weeks later than usual in central Texas and light infestations were present in many cotton fields

(*Turn to Page* 57)

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TECHNICAL Briefs

Recent Technical Developments in the Agricultural Chemical Field

Foliage Fungicides Tested

A report of field studies on glyoxalidine derivatives as foliage fungicides appears in the January-March, 1946 edition of *Contributions from Boyce Thompson Institute*, page 161. The authors, H. W. Thurston, Jr., John B. Harry, F. H. Lewis, A. B. Groves and C. F. Taylor, summarize their findings as follows:

1. Three glyoxalidine derivatives, 1-hydroxyethyl-2-heptadecylglyoxalidine (No. 337), 2-heptadecylglyoxalidine (No. 341), and 1-aminoethyl-2-heptadecylglyoxalidine (No. 630), investigated in the laboratory have been tested in the field during several years for the control of black spot of rose, apple scab and rust, late blight of potato, and cherry leaf spot.

2. On roses (one year's test) 2-heptadecylglyoxalidine at 3 lb. per 100 gallons gave black spot control equivalent to Bordeaux mixture with wetting agent, and with less conspicuous deposit. 1-Hydroxyethyl-2-heptadecylglyoxalidine was less effective and somewhat injurious.

3. In tests over a five-year period in Pennsylvania on apples, var. McIntosh and Stayman, 1-hydroxyethyl-2-heptadecylglyoxalidine and 2-heptadecylglyovalidine at 1 lb. and 1-aminoethyl-2-heptadecylglyoxalidine at 3 lb. per 10 gallons gave control of apple scab equivalent to standard lime sulphur and much better than a trade name product at 3 lbs. 1-Hydroxyethyl-2-heptadecylglyoxalidine caused some foliage injury at 3 lb. per 100 gallons. 2-Heptadecylglyoxalidine at 1 lb. per 100 gallons produced consistently better appearing foliage with greater area per fruit spur than standard lime sulphur and had a marked residual effect on control of scab on foliage. The glyoxalidine derivatives have much steeper dosage response slopes than a commercial preparation in the field. Against cedar-apple rust 2-heptadecylglyoxalidine was fairly effective but not equal to the same commercial preparation.

4. 2-Heptadecylglyoxalidine has been shown to be compatible with acid lead arsenate, nicotine sulphate, excess hydrated lime, and summer oil.

5. The glyoxalidine derivatives caused foliage injury of potato and did not control late blight; this was in accordance wiht laboratory results.

6. In four years' tests in Pennsylvania and Virginia and two years' tests in West Virginia, 2-heptadecylglyoxalidine on sour cherries, var. Montmorency, at 1 lb. per 100 gallons was demonstrated to be the most effective compound tested for the control of leaf spot defoliation. There was little or no leaf injury and no dwarfing of fruit.

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Chicken-Louse Powders

Experiments by H. S. Telford (*J. Econ. Entomol. 38*, 573-6) indicate that various speeds of effectiveness are noticeable in treating chicken lice. Various louse powders were applied by means of a salt-shaker type of applicator to fowl infested with various types of lice. Mixtures of powder which acted quickly and showed residual effect were: 0.5 per cent DDT, 10 per cent derris containing 5 per cent rotenone, 2 per cent and 10 per cent tetramethyl thiuram salts, and powders containing 30 per cent sulfur plus one of the following compounds: 5 per cent phenothioxine, 5 per cent biphenyl, 0.066 per cent pyrethrins, 5 per cent "Thanite" and 5 per cent each of three commercial materials. Sodium fluoride 33 per cent, cryolite 30 per cent, and micronized wettable sulfur were highly effective but slow in action, the report stated.

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Use DDT on Grasshoppers

A bulletin by J. R. Parker of the U.S.D.A., Bureau of Entomology and Plant Quarantine tells of experiments carried on with DDT in control of grassphoppers. The insects were found to be highly susceptible to DDT dusts, sprays and aerosols. Twenty pounds per acre of 15 per cent DDT in pyrophyllite applied either as a dust or spray reduced heavy infestations of grasshoppers to non-economic numbers without injury to foliage. Unless washed off by heavy rains, DDT applied as a spray continued to kill over a period of several weeks, and in this respect was more effective than dust which was removed by either wind or rain. Both the spray and dust exhibited a marked repellent effect.

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Seed Grain Fumigants

Use of grain fumigants such as hydro-cyanic acid, methyl bromide or chloropicrin destroys insect infestation in stored grain, according to an article by R. T. Cotton appearing in the 1946 *Seed Trade Buyers Guide*. Such fumigation inflicts no material damage to germination, it continues, if the seed moisture is not over 12 per cent, exposure periods are not over 24 hours and the seed is aerated immediately thereafter, and the dosages are not excessive. A magnesium oxide dust mixed with the seed at the rate of 1 ounce per bushel, or a dust containing 3 per cent of DDT in a suitable carrier, applied at the rate of one-half ounce of the mixture per bushel of seed, affords effective and inexpensive long-time protection against infestation by insects. The DDT dust will protect seed of any moisture content, but the effectiveness of the magnesium oxide decreases as

PENCO DDT Concentrates OFFER YOU THE BEST IN DDT

PENCO DB-50—a specially compounded dry powdered dust base containing 50% DDT. This product is designed for use by insecticide manufacturers in the formulation of finished dusts for agricultural and household purposes.

PENCO WB-50—a micronized powder containing 50% DDT and certain wetting agents which will mix readily with water. This product is specially desirable as an agricultural spray due to its particular particle size. It may also be used satisfactorily as a barn spray.

PENCO EMULSION CONCENTRATE—a specially developed concentrate designed for use as a water emulsion spray where a minimum visible residue is desired.

PENCO CATTLE SPRAY—a dry wettable powder which is stable in water suspensions. It contains 50% DDT and suitable quantities of wetting and sticking agents which will aid in wetting out the hair of animals, depositing DDT thereon and maintaining residual insecticidal effects. The product may be used with equal success as a livestock dip. Where water suspension sprays are desired on barns, PENCO CATTLE SPRAY may be used.

To be most effective as an insecticide, DDT must be carefully compounded and the correct combination applied at the proper concentration for control of any specific pest. Products such as those offered by The Pennsylvania Salt Manufacturing Company may be relied upon for uniform degrees of strength and strict scientific formulating.

Made up into such products, DDT *is* highly valuable in controlling many insects on livestock, vegetables, fruit and other crops. Especially extensive and satisfactory have been the results of the use of DDT products as applied to the control of Colorado potato beetle, potato leafhopper, potato flea beetle, corn borer, corn ear worm, cabbage worm, pea weevil, pea aphid, bean leaf rollers, thrips, cucumber beetles, pickle worm, melon worm, tomato fruitworm, tomato pinworm. In whatever form used, it is noteworthy that the effects of DDT, as a killing agent, last longer than those of most other insecticides, but that its effects are frequently slower in manifesting themselves.

PENCO AGRICULTURAL CHEMICALS

Kryocide

Reg U. S. Pat. Off.

Pennsylvania Salt has been a pioneer in preparing and marketing this superior product—the natural Greenland cryolite. As an insecticide Kryocide helps to protect crops from Coast to Coast... in the apple orchards of the Northwest... on the sugar plantations of Louisiana... in the truck gardens of Florida... in the tobacco fields of the Carolinas.

AGRICULTURAL CHEMICALS DIVISION

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the moisture content of the seed increases above 12 per cent. The article also warns that seed treated with any of these dusts should not be used for food by man or livestock, DDT in particular being poisonous to warm-blooded animals as well as insects.

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Wireworm Control in Calif.

Control of wireworm through use of two soil fumigants, "D-D" and "EDB" is reported by the California Agricultural Experiment Station in a recent bulletin. Until introduction of these chemicals (dichloropropane-dichloropropene and ethylene dibromide), no practical and economical method of wireworm control was possible, according to Dr. W. H. Lange, author of the bulletin and director of the investigation.

Information in the bulletin is based on experiments and commercial applications conducted in the past two years. The chemicals are introduced into the soil with a special drill before the crop is planted, with the result that the wireworms are kept under control. Cost of the fumigants, states Dr. Lange, is "more than compensated for" in the increased yield from a single crop following the treatment.

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New Specialty Aids Rooting

In a recent issue of its employee magazine *Dow Diamond*, Dow Chemical Co., Midland, Mich., describes its chemical preparation designed to speed root growth in cuttings and slips. Marketed under the trade name of "Quick-Root," the product is manufactured under the designations of No. 1 and No. 2, each of which is used for different types of plants. One is recommended for cuttings which root readily, requiring from two to six weeks to develop roots. The other is for more difficult-to-root cuttings, requiring up to 12 weeks to develop a root system. The product is claimed to be easy to apply, with no equipment nor technical skill necessary. The basal end of a tipped or budded cutting is wetted, says the article, and then dipped into about a half inch of the powder before being packed into sand for growth.

Rotenone for Cattle Lice

According to experiments conducted by C. Lyle and R. G. Strong (*J. Econ. Entomol. 38*, 611-12) control of cattle lice was apparently more effective through a dust containing 0.5 per cent of rotenone, than through a 10 per cent DDT dust application. Dust blown directly against the animals was probably most effective, but dust cloud applications were satisfactory, according to the report. Small plunger and fan dusters give rapid and economical control with two applications, it said.

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Japanese Weevil in N. J.

A survey by the New Jersey Bureau of Plant Industry, State Department of Agriculture has been launched in Bergen and Passaic counties to determine the numbers and extent of infestation of Japanese weevil recently discovered there. The insect, known as the long-horned weevil is a native of Japan and according to Harry B. Weiss, chief of the State Bureau of Plant Industry, might become more of a menace to flowering plants and vegetables than the Japanese beetle if permitted to colonize in large numbers. The adult insect is about one-eighth inch in length, black, with greyish white scales and is wingless. For control of the pest, Mr. Weiss indicated that arsenate of lead and probably DDT should be effective against it.

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Better Fungicides Needed

Need for better fungicides to control plant diseases is expressed by S. E. A. McCallan in the January-March, 1946 edition of *Contributions from Boyce Thompson Institute.* Outstanding Diseases and Uses of Fungicides" . . . (p. 105). The author presents statistics on major crops and outstanding agricultural diseases in the U. S., listing the host, the disease name, the organism, and the per cent of loss for the decade 1930-39.

In order to facilitate research on new fungicides and specifically the selection of rapid methods for evaluating them in the laboratory and greenhouse, says Mr. McCallan, it is necessary to know the outstanding plant diseases. A tentative method is presented for determining the importance of the disease loss on an over all or national basis.

A table is given of the 50 leading agricultural crops of the United States together with the farm value, acreage and farm value per acre, as well as the five leading states. The 36 outstanding diseases obtained by the above procedure are recorded, together with annual average loss, 10-year range in fluctuation and present major control measures. Tables are also presented showing the estimated annual consumption of fungicides by chemicals and by crops and diseases. From this the more outstanding potential uses may be seen for new or improved fungicides, and hence the diseases for which it is desirable to develop test methods. Among the outstanding diseases where need for better fungicides is indicated are: corn and cotton seedling blights, and oat smuts, (seed treatments) apple scab, potato tip burn and late blight, peach and cherry brown rot, pear blight, peanut leaf spot and tomato blights (sprays and dusts). More or less adequate laboratory or greenhouse methods for fungicide evaluation are available in certain of the cases cited while development and standardization is necessary for most other important diseases.

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Poison Bait for Moles

Poisoned bait composed of a strychnine-coated milo maize for control of moles in gardens and lawns is recommended by Arkansas Agricultural Experiment Station, Fayetteville. Because moles live almost exclusively on animal matter, usual control methods have consisted of traps and poisonous gases, points out W. J. Baery of the College Dept. of Entomology. He says that if poisoning is done with the right kind of bait, moles may be quickly eliminated from gardens. The milo maize bait he mentions is based on a formula developed by the Fish and Wild Life Service of the U. S. Department of the Interior. Best results are obtained by inserting the bait in burrows used as runways by the moles, he asserts.

INDUSTRY NEWS

Camson Heads Orbis I. D.

Edwin J. Camson has been appointed sales manager of the Insecticide Division of Orbis Products Corp., New York, according to a recent announcement from the company. He succeeds Robert F. Joyce, who died suddenly on April 3rd. Mr. Camson graduated from Columbia University in chemical engineering in 1932 and since that time has been associated with Orbis at the company plant at Newark, N. J., working under the direction of Robert Wotherspoon who pioneered in the commercial extraction of rotenone resins from derris root.

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Fred C. Stewart Dies

Professor Fred C. Stewart, 78, former head of the division of plant pathology at the New York State Agricultural Station at Geneva, N. Y., died April 25 in Willard, N. Y. Mr. Stewart retired in 1936 after having served in the department for many years. He first came to the station in 1894 as mycologist, resigning three years later for advanced study at Cornell U., after which he toured Europe. Upon returning, he became botanist at the station and was appointed head of the plant pathology department in 1898.

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Cyclic Corp. Formed

Under the name of Cyclic Chemical Corporation, Paul R. Eisenhuth and Wallace F. Helies have established in Chicago a new organization to manufacture and market organic and inorganic chemicals. Products include silica gel, zinc ammonium chloride fluxes, core oils, emulsifiers, wetting agents and aromatic hydrocarbons.

Both men were recently executives in the Velsicol Corporation, prior to which Mr. Eisenhuth was with Sherwin-Williams Co., Standard Ultra Marine Co., the Chemicals Bureau of the War Production Board; and Mr. Helies was with Chemical Products Division of Standard Oil Co.

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Janes to Socony-Vacuum

Dr. M. J. Janes

Dr. Melvin J. Janes, for the past year employed in insect control supervision by the Army Ninth Service Command, has recently joined the staff of Socony-Vacuum Laboratories as an entomologist. Dr. Janes holds B.S. and M.S. degrees from Utah State Agricultural College, and a Ph.D. from Iowa State College. His entomological career began in 1935 with the Texas Agricultural Experiment Station where he was engaged in cotton, fig, and truck crop insect investigations. He was later associated with the Virginia Agricultural Experiment Station in fruit insect research before taking up duties with the Ninth Service Command.

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New du Pont DDT Product

A new combination insecticide containing several active ingredients including DDT is announced by E. I. du Pont de Nemours & Co., Wilmington, as being effective on certain insects and diseases infesting fruit and vegetable crops. The combination contains DDT, rotenone, and the ferric and zinc dimethyl dithiocarbamates supplied by "Fermate" and "Zerlate" fungicides. Diseases controlled by the dust, according to the announcement, include bean and tomato anthracnose, celery leaf blights, leaf diseases of cucurbits, early blight of potatoes, apple rust and scab, brown rot of stone fruits, pear scab, rose leaf spot, and various other rusts, mildews and leaf spots. One product is also said to be effective against a variety of insects which attack orchards and field crops.

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Rotenone Use Predicted

With lower prices for rotenone-bearing roots and good prices for agricultural products, the Office of Foreign Agricultural Relations of the U.S.D.A. estimates that United States consumption of rotenone roots in the coming year may possibly double that of 1940-41, or amount to perhaps 13,000,000 pounds. The O.F.A. also estimates that the annual consumption of 5 per cent roots will reach 10,000,000 pounds over and above that necessary for restocking of inventories, if supplies are available.

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Pennsalt Spray Announced

Pennsylvania Salt Mfg. Co., Philadelphia, announces the development of a new DDT livestock spray marketed in two-pound paper bags under the trade name, "Pensalco Livestock Spray." The product is a dust containing 50% DDT with other active and inert ingredients, for use either as a dip or for insect control. According to its makers, the spray wets the hair to give residual toxicity, and may also be used on walls of barns and other farm buildings.

Argentine Insect Conscious

Consciousness of insect pests, their depredations and problems concerning them, is becoming more widespread throughout South America and especially in the Argentine among agriculturists and cattle raisers, according to E. B. Twyman, president of John Powell y Cia.,

E. B. Twyman

Buenos Aires, associate company of John Powell & Co., New York. The insect problems of agriculture in the Argentine are essentially the same as in the United States. Their solution is being improved through general education and a wider dissemination of information by the Argentine Ministry of Agriculture which publicizes new methods of insect control and insect borne disease control, said Mr. Twyman, who returned to Buenos Aires last month after a six weeks' stay in New York.

Improved insecticides and fungicides and better methods of application are retarded to a considerable degree by the average farmer's lack of funds, Mr. Twyman pointed out. Nevertheless, the consumption of insect control products is spreading. Use of the newer oil sprays and fumigation of fruit trees are meeting with success. Combating a locust plague during the 1945-46 season was retarded to a great extent by slow hand application of insecticides. Airplane spraying or dusting has not yet reached South America. Other large-scale application methods are few. Cattle dips are used, but other stock insect and disease control methods lag. Practically all insect control products are supplied by local manufacturers owing to high import duties. Long-distance education as now being carried on by the government departments will in time bring wide increase in the use of insecticides, Mr. Twyman concluded.

Accompanying Mr. Twyman to Buenos Aires from New York was George Hartz, chief chemist for John Powell & Co., New York, who will spend six months in the Argentine at the Powell factory and also at their experimental pyrethrum farm near San Juan city in the Province of San Juan.

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New Surface Sprayer

A sprayer for applying residual or surface treatments in barns, dairies is being developed by Paul Engstrum, industrial engineer, 1001 14th Street, N.W., Washington, D. C. Cooperating with Mr. Engstrum and his associates in the development of this and similar equipment, is Dr. W. E. Dove.

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Du Pont Offers 2,4-D

E. I. du Pont de Nemours & Co. recently announced the development of its own formulation of 2,4-Dichlorophenoxyacetic acid weed killer. The product is being offered in powder form for large-acreage application and in tablet form for small-area use. A statement by the company's Grasselli Chemicals Department explains in detail the work of 2,4-D, including warnings against use of the herbicide on bent grass, and instructions on proper use.

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Fellowship Contributors

The New York State Agricultural Experiment Station, Geneva, N. Y., reports the following list of business firms who have recently contributed funds for fellowships and investigatorships bearing on entomological projects: American Cyanamid & Chemical Corp., Dow Chemical Co., Freeport Sulphur Co., Harshaw Chemical Co., Merck & Co., Niagara Sprayer & Chemical Co., Onyx Oil & Chemical Co., Rohm & Haas Co., Stauffer Chemical Co., and Tennessee Corp.

Oronite Names President

George L. Parkhurst has been elected to the presidency of Oronite Chemical Co., San Francisco, a subsidiary of Standard of California. Mr. Parkhurst succeeds R. G. Smith who continues with Oronite as a member of the board of directors. Mr. Parkhurst comes into his new

George L. Parkhurst

position with many years of experience with the company and in related fields. During the war he served in several capacities in government service with the Petroleum Administration, and previous to that had been active in chemical circles with Standard Oil in the Chicago area.

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Harry Page, Sr., Dies

Harry Page, Sr., 67, of Cranford, N. J., died at his farm home on May 16 following an illness of several months. Mr. Page was a horticulturist and a gladiolus grower, engaging in the work commercially. He had exhibited his flowers in numerous shows, and in one season won eighteen blue ribbons for a gladiolus exhibit at the New York Botanical gardens. In recent years he was in charge of the Botanical Gardens of the Leonard, N. J. High School.

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New Hudson Sprayer

H. D. Hudson Manufacturing Co., Chicago, has published descriptive folders on three of its spraying outfits; two electrically operated, and the other a hand spray.

M. H. Lockwood heads N. F. A.

TEN days prior to the opening of its 21st Annual Convention at French Lick Springs, Indiana, the board of the National Fertilizer Association announced that Maurice H. Lockwood had been named president of the Association. Mr. Lockwood, Fertilizer Research Manager of the Eastern States Farmers' Exchange, West Springfield, Mass., will assume executive direction of the Association's activities with headquarters in Washington, on July 1. Mr. Lockwood has long been prominent in the fertilizer industry, and was Chairman of the N.F.A. Board of Directors before being named President. He has been engaged in agricultural pursuits all his business life, beginning as a county agent following his graduation from the University of Connecticut.

M. H. Lockwood

The Association's annual convention, held June 10, 11 and 12, at French Lick Springs, featured addresses by a number of leading authorities in the industry, and included election of officers.

Among the speakers were Dr. Harry J. Reed, Director, Indiana Agricultural Experiment Station, who discussed "Maintenance of Soil Fertility," and James A. Stillwell, Advisor on Supplies for War Areas, Department of State, who talked on "The World Food Situation." Dr. H. B. Siems, chairman of the association's plant food research committee described the recent work of that committee.

The recent potash allocation order and the effects of the coal and steel strikes on fertilizer supplies were discussed at length. The annual meeting of the association board was held following the close of the convention on June 12.

Yolo County Dusting Law Now in Effect

DUE to the short time since June 1, the day on which the Yolo County (California) ordinance No. 201 (controlling the spraying of agricultural insecticides) was to become effective, industry observers are as yet unable to determine what total effect its enforcement will have on growers of fruits and vegetables in the area. The law, which regulates the use and application of poisonous dust and makes the user liable for damages and injury to animals or property on other farms, was passed by the Yolo County Board of Supervisors in February of this year.

The ordinance requires any custom sprayer of "poisonous dry material" to apply for a permit in writing to the agricultural commissioner, giving name, address, a description of the crops to be treated, where they are located, and what materials are to be used. Charge for the permit is one dollar. However, when a person wishes to dust or spray his own crops which are for the purpose of "consumption by himself or his immediate family or employees," no permit is necessary.

Proof that the person or firm to do the spraying or dusting is covered by liability insurance of not less than $5,000 is also required under the terms of the law. He is responsible for damage on the property of neighboring farms if the poisonous dust or spray is applied "negligently or carelessly" so as "to cause the same to settle or deposit in amounts sufficient to be injurious to bees, livestock or any other property upon any land or property of another person where livestock are being pastured or held . . . or where feed for livestock is being produced or stored by any person having any right in or to said land."

Owners of containers of poisonous dry material are required by the ordinance to "write or stamp in legible letters the owner's name on the top and bottom of the container" before opening. The law further requires that if the container is of combustible material, it must "be burned by the owner thereof the same day it is opened."

Violators of the ordinance face a misdemeanor charge which upon conviction is punishable by a maximum fine of $500 or up to six months in jail, or by both fine and imprisonment. Such an offender also loses his permit in Yolo County.

Long debate and discussion preceded enactment of the new law. In a three-hour hearing before final vote on the measure, fruit and vegetable growers, most of whom were opposed to the bill's passage, with livestock breeders and beekeepers aligned on the side of the bill's proponents, aired their views. Testimony of a local veterinarian indicated that from 75 to 100 head of cattle had died from arsenical poisons, and that there was no estimate on the loss to breeders from decreased production. The doctor said that the effect of arsenic on cattle is cumulative; that a small percentage of poison from an initial spraying might be stored in the animal's liver, and more is added with subsequent treatments until the animal may finally be killed. Spokesmen for the tomato growers pointed out that the use of dusts to kill worms on tomatoes is necessary in the county. "If you eliminate poisonous dusts entirely you are going to eliminate some Yolo County crops altogether," one of the spokesmen warned. The beekeeper group had a particular grievance against airplane dusters, demanding that careless spraying be stopped.

Helping Food Production . . .

THIS association provides constant liaison between the industry and the Federal and various State governments. Such liaison has been outstandingly effective during the long and still continuing emergency. It will always be useful because, like agriculture itself, essential aids to agriculture are in the public interest. Pest control products are essential.

Such close contact enabled this Association to obtain exemption of insecticides and fungicides from the freight embargo. Still more recently, application was made for coal priorities for the industry's factories. In both instances full U. S. Department of Agriculture support was secured.

The Association furnishes information on available supplies and relays word of shortages, assisting both industry members and government to plan ahead. Information useful to agriculture is distributed to the grower's key advisers.

Agricultural Insecticide & Fungicide Association

285 Madison Ave. **New York 17, N. Y.**

OFFICERS

GEORGE F. LEONARD, *President*

HAROLD C. DAVIES, *Vice-President*

LEA S. HITCHNER, *Executive Secretary and Treasurer*

Potash Under Allocation

POTASH MURIATE was placed under allocation by the Civilian Production Administration on June 3 because of the growing scarcity of potash salts especially for fertilizer purposes. The order became effective with the issuance of Schedule 120 of General Allocation Order M-300. This means that a fertilizer manufacturer who wishes to buy potash must file on form CPA-2945 (in triplicate) with Civilian Production Administration. Chemicals Division (Ref.: M-300-120) Washington 25, D. C. This application must tell the end use of the desired potash. The same is true for suppliers who must also make application to CPA (using form CPA 2946). An aggregate quantity may be requested, without specifying customers' names, for delivery on exempt small orders. Filing date is July 15 for period 8*.

Any potash not used in the period for which it is allocated may be used at any time thereafter, according to the order. This does not apply to undelivered parts of allocations at the end of a period, however. Before a supplier receives an authorization, he may deliver to any customer an amount of potash equal to 20 per cent of the supplies delivered to the same customer in the corresponding period of the year ending May 31, 1946. But amounts so delivered will be deducted from the potash permitted during the allocation period for which authorization is received.

The order states that applications and specific authorization are not required for "delivery of potash by any person who is not a producer or importer of potash." nor for the "acceptance of delivery of potash from any person who is not a . . . producer or importer." Use of potash received from any person not a potash producer or importer is also exempted from the order, provided that the user is not a fertilizer manufacturer or a potash producer or importer. Small order exemptions for each person is 50 tons (K-20 basis) during each even numbered allocation period, and 10 tons during each odd numbered allocation period.

Any newly-organized fertilizer company or existing company which has constructed or is now constructing new mixed fertilizer plants is urged to communicate with the CPA immediately, giving information covering the new plant's capacity, its location, volume of mixed goods to be processed, potash content of proposed formulas, and whether or not the company has a firm source of supply for phosphatic and nitrogenous materials. Also to be included is information as to the number of shifts to be worked and the expected days of operation per year, the present status of plant construction, expected date of initial operation, and the approximate area to be served.

* Allocation periods are designated as follows: Period 8 began June 1, 1946 and will continue through March 31, 1947. Period 9 is April 1, 1947 through May 31, 1947.

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Rotenone Shortage Acute

Shipments of rotenone-bearing cube root from South America approximating a reported 1,000 tons which were expected to arrive in the United States between June 15 and July 1 have been indefinitely delayed in shipment. Reports state that the river steamer which was supposed to bring the root to the sea coast in South America was crippled and that shipments have been delayed for a month or more as a result. No substantial lots of rotenone roots are expected to reach the United States before August first, according to latest estimates, which date makes it too late for use during the current season. Spot rotenone stocks are said to be practically bare.

Other insecticide materials are also short. Owing to the coal strike and the inability to obtain monochlorbenzene, some manufacturers of DDT have suspended operations and available DDT has been reduced to a minimum. Pyrethrum stocks which are larger in the U. S. A. than for some time are stated to be threatened with heavy reduction by purchases by UNRRA for use abroad. Coupled with small stocks of arsenates, cryolites and other materials, the entire insecticide supply situation is held to be dangerously short.

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Agricultural Research Bill

A bill to provide the Department of Agriculture with an annual appropriation of $3,000,000 for its research program in each of the next five fiscal years, plus $1,500,000 annually over the same period to further the present programs of agricultural extension work, is proposed before the house committee on agriculture in Washington. The bill, (H. R. 6548) is sponsored by Representative John W. Flannagan of Virginia, Committee Chairman.

Passage of the bill would empower the Secretary of Agriculture to launch extensive research into the laws and principles underlying agricultural problems, including improvement in methods of production, marketing, distribution, processing and utilization of plant and animal commodities; eliminating waste, and finding new and extended uses and markets for agricultural commodities and by-products.

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Ammonia Sulfate Committee

A Sulfate of Ammonia Industry Advisory Committee has been appointed by the Office of Price Administration, it was announced recently. Membership of the committee is as follows. W. H. Earle, Philadelphia Coke Co.; C. S. Edwards, Nitrogen Products, Inc.; John V. Freeman, United States Steel Corp. of Delaware; C. E. Hilkert, Republic Steel Corp.; B. P. Mulcahy, Citizens Gas & Coke Utility; P. H. Neal, Alabama By-Products Co.; Philip S. Savage, Donner-Hanna Coke Co.; J. D. Saylor, Koppers Co., Inc.; K. B. Stuart, Colorado Fuel & Iron Corp.; F. T. Techter, Allied Chemical & Dye Corp.; and C. J. Wurdock, Ford Motor Co.

End DDT Poison Label

Poison labels on DDT products are no longer required in the state of Minnesota, following a decision on April 18 by the State Department of Agriculture, according to an announcement by Henry J. Hoffmann, chief chemist of the department. In a letter to the National Association of Insecticide and Disinfectant Mfrs., Inc., Mr. Hoffmann states that after collecting all the information possible regarding the toxicity of DDT the department has decided that products containing DDT may be marketed in Minnesota without the word "poison" on the label.

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Colorado Follows Suit

State laws requiring the appearance of skull and cross bones and the word "poison" on DDT products have been removed in Colorado, according to an announcement made late in May by the Colorado Director of Agriculture through the Bureau of Plant and Insect Control. This relaxation of the label law, however, applies only to solutions containing less than 10% DDT. Stronger concentrations will continue to carry the word "poison" and the skull and cross bones. Continued also is the requirement that all DDT products offered for sale in Colorado carry a caution and antidote on labels.

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Lethane B-71 for Thrips

Control of onion thrips is reported to be accomplished through the use of Lethane B-71, developed by Rohm & Haas. The new product, a contact insecticide, has been used successfully in Texas and other onion growing areas of the south. When combined with DDT, the result is reported to be unusually swift, with the DDT providing residual properties against the pest. In two carefully timed applications, onion fields were cleaned in the Texas area. Timing is said to be of importance, particularly dusting early in the season, including ditch banks and grain fields bordering the onion fields. Thrips sometimes feed on weeds and grasses until hot weather forces them into the onion plants. The second application follows about one week later, to complete the job.

Knipling Receives Insect Control Citation

In recognition of his contributions toward control of typhus-bearing insects, Edward F. Knipling of the Bureau of Entomology and Plant Quarantine, U.S.D.A., receives a medal from Clinton P. Anderson, Secretary of Agriculture. At the right is Brig. Gen. S. Bayne-Jones, Director of the Typhus Commission.

Mr. Knipling helped develop control methods of typhus-bearing insects, including the adaptation of DDT against body lice and dimethyl phthalate against scrub typhus.

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Horticulturalists Meet

In its 59th annual meeting at the Columbus and McAllister Hotels, Miami, Fla., April 30 and May 1st and 2nd, the Florida State Horticultural Society and its affiliates heard reports on control of plant diseases, insect pests and weeds, and details of newly-developed equipment to apply insecticides. The speakers included men from Florida Experiment Stations, representatives of the citrus and vegetable industries, officials of the U. S. Dept. of Agriculture, and civic leaders from the state of Florida.

Topics discussed at the three-day session put emphasis on the importance of pest control in horticulture. Among these subjects were included addresses such as "Use of DDT to Control the Little Fire Ant," by M. R. Osburn, and N. Stahler, Bureau of Entomology and Plant Quarantine, Ft. Pierce, Fla.; "Preventive Spray for Mite Control" by W. L. Thompson, Citrus Experiment Station, Lake Alfred, Fla.; "Progress Report on Chemical Weed Killers" by Dr. T. W. Young, Citrus Experiment Station, Lake Alfred; "A Fog Machine for Applying Insecticides," Dr. E. G. Kelsheimer, Vegetable Crops Laboratory, Bradenton, Fla.; "Present Status of Wire-Worm Control in South Florida," Dr. J. W. Wilson, Everglades Experiment Station, Belle Glade, Fla.; "2-4-D for the Control of Nut Grass," Dr. A. L. Harrison, Vegetable Crops Laboratory, Bradenton; "Chemical Control of Weeds on Farm Ditches" by Mrs. H. H. Wedgeworth, Belle Glade; "Insects Affecting Sweet Potatoes in the Everglades," by Dr. W. D. Wylie, U. S. Sugar Co., Clewiston, Fla.; "Control of Tomato Late Blight in Seed-Beds," by Dr. A. L. Harrison, Vegetable Crops Laboratory, Bradenton; and "Pineapple Mealybug Control Studies," by Dr. D. O. Wolfenbarger, and Dr. P. J. Westgate, Sub-Tropical Experiment Station, Homestead, Fla.

Business sessions of the groups represented, inspection trips to garden spots in the area and recreational activities occupied the time between addresses.

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Dr. Groth to Alabama Post

The Alabama State Department of Agriculture has announced the appointment of Dr. A. H. Groth as director of the regional animal disease research laboratory at Auburn, Ala. Dr. Groth succeeds Dr. B. T. Simms who resigned several months ago to become chief of the department's Bureau of Animal Industry.

$50,000 for Research

The Herman Frash Foundation for Chemical Research is offering to Universities and other non-profit research institutions grants of up to $10,000 a year for five years' research in agricultural chemistry. Recipients of the grants will be chosen by the foundation trustees, with the advice of the American Chemical Society.

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Co-op Buys Sprayer

Farmers Union Co-op Oil Co., Concordia, Kansas, announces the purchase of a power spraying outfit for the use of members of the group.

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Rodent Control Discussed

Emphasizing the need for rodent control as a public health measure, the first annual short course for sanitary engineers was held at Purdue University, April 29 to May 3. Ninety persons from seventeen states were in attendance. The training course was in charge of Dr. J. J. Davis, head of the department of entomology of the university, with the U. S. Fish and Wildlife Service, the U. S. Public Health Service, and the Indiana State Board of Health cooperating.

Prominent in the discussions was the subject of rodenticides, their use, and hazards encountered with their application by unqualified persons. Compound "1080," ANTU (Alphanapthylthiourea) and other rodenticides were discussed by H. J. Spencer, of the U. S. Fish and Wildlife Service, Gainesville, Fla., and G. C. Oderkirk of the same department, located at Purdue. It was pointed out that compound 1080 is poisonous not only to rats and other rodents, but toxic also to domestic animals. ANTU was indicated to be highly toxic to the Norway rat, particularly adults.

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New Georgia Bill Signed

A bill providing for regulation and control of poultry remedies and the licensing of manufacturers of such products, has been recently signed by Governor Ellis G. Arnall, of Georgia.

Industry Patents

The following patents have recently been issued by the U. S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 10c each by addressing the U. S. Patent Office, Washington 25, D. C.

No. 2,396,449. SPRAY NOZZLE. Patent granted March 12, 1946, to Fred W. Wahlin, Oak Park, Ill., assignor to Spraying Systems Co., Chicago. A nozzle of the class described comprising a nozzle body provided with an inlet leading into the interior thereof, said nozzle body having an outlet opening with a series of passageways circumferentially spaced along the margin thereof and leading from the interior of the nozzle body in mutually convergent and mutually non-conflicting directions that extend across the opening and over the opposite margin thereof.

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No. 2,398,369—SPRAYING APPARATUS, patent granted April 16, 1946, to Haig S. Garabedian, Watertown, Mass. In a spraying apparatus, the combination of a supply tank, a discharge hose connected with the forward end of said working tank, a piston slidable backward and forward in the working tank, a valved hose connection at the rearward end of the working tank, a vent valve, and a chassis on which both tanks are mounted for transportation while in cooperative relation to each other.

* * *

No. 2,399,597. ANTHELMINTHIC. Patent granted April 30, 1946, to William R. Jones, Oakland, Calif., and Howard A. Jones, Orlando, Fla., assignors to the United States of America as represented by the Secretary of Agriculture. A product having anthelminthic properties resulting from the process comprising treating a solution of oil of rose geranium and hexane with calcium chloride, removing the liquid from the resulting precipitate, treating the removed liquid with phthalic anhydride to form the acid phathalates of the alcohols present in the liquid, dissolving the acid phthalates with potassium hydroxide to saponify the phthalates, removing the liberated alcohols and other products from the saponified phthalates, and fractionally distilling the liberated alcohols and other products, collecting that part of the distillate which distills at 111° to 117° C. at 12 mm.

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No. 2,400,006. INSECT REPELLENT COMPOSITIONS. Patent granted May 7, 1946, to Howard A. Jones and Bernard V. Travis, Orlando, Fla., assignors to the United States of America as represented by the Secretary of Agriculture. An insect repellent composition comprising a compound of the general formula

$$RO.C_6H_4.R'\,OH$$

wherein R is an alkyl group and R' is a divalent radical having the general formula C_nH_{2n}, where n is an integer of at least one, and RO and R'OH are in the ortho position to each other, incorporated in a carrier selected from the group consisting of a vegetable oil, an inert powder, and water.

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Suction Berry Picker

A cranberry-picking machine which in tests last fall harvested 250 pounds per hour against 100 pounds by the average handpicker, is announced by Cranberry Canners, Inc., a co-operative organization. The machine operates on the principle of a vacuum cleaner with a rubber hose pulling the berries off the vines and depositing them in a rubber-lined container. Dust and weeds are drawn off before the berries are placed in the container. Reports indicate that suction picking does not disturb the buds as does handpicking, thus permitting an increased annual yield. Originally designed for use in the state of Washington, the machine is expected to be used also in the Massachusetts cranberry-growing regions. Labor shortages in the industry which have been acute within recent years stimulated development of the mechanical picker.

New Trade Marks . . .

Application has recently been made to the U. S. Patent Office for registration of the following trade-marks for products in the agricultural chemical field, and the marks listed were published in April and May issues of the OFFICIAL GAZETTE. The Patent Office requires that notice of any opposition to registration of a trade-mark be filed within thirty days of publication in the GAZETTE, accompanied by a fee of ten dollars.

Trade Mark Applications

ATTACLAY—In capital letters. Finely divided Fuller's Earth used as an insecticide carrier or diluent. Filed April 14, 1945, by Attapulgus Clay Co., Wilmington, Del. Claims use since Feb. 23, 1945.

HYPOZENE — In hand-lettered capital letters, for chemical used for the generation of a greenhouse fumigant. Filed Nov. 27, 1945 by Hydroponic Chemical Co., New York. Claims use since Nov. 23, 1945.

N-I-U — In pyramid capital letters for insecticide in composition form. Filed Jan. 17, 1946 by The Griffith Laboratories, Inc., Chicago. Claims use since on or about Dec. 17, 1945.

LIKWID LYFE—The word "Likwid" in script, "Lyfe" in capital letters. For fertilizer. Filed Oct. 22, 1945, by Clyde Vaughn, doing business as Pestless Products Co., Pasadena, Calif. Claims use since Feb. 1, 1945.

ATOMIC SPRAY—This in two-line capital letters, for insecticides. Filed Aug. 24, 1945 by Continental Distributors, Inc., Washington, D. C. Claims use since Aug. 16, 1945.

ATO-MIC—This in hyphenated capital letters, for insecticides. Filed Sept. 17, 1945 by X-Press Chemical Co., Brooklyn, N. Y. Claims use since Aug. 14, 1945.

PYRENONE — This in capital letters, for insecticides. Filed Nov. 14, 1945 by Dodge & Olcott, Inc., New York. Claims use since Feb. 27, 1945.

EUREKA—This in curved capital letters, for distributors in the nature of attachments for use in connection with air circulating devices such as suction cleaners for adding various agents to the air, such as insecticides. Filed June 26, 1943 by Eureka Vacuum Cleaner Co., Detroit. Claims use since on or about 1929.

INTERNATIONAL—In open capital letters between concentric circles. For insecticides and aluminum stearate. Filed Dec. 15, 1945, by International Lubricant Corp., Southport, La. Claims use since March, 1937 on insecticides and since May, 1938 on aluminum stearate.

SAVEE—In capital letters with oversize "V." For insecticide. Filed Nov. 27, 1945, by Eight-in-One Products Co., Valdosta, Ga. Claims use since Aug. 27, 1945.

DIANOL — In tall capital letters, for insecticide and insect repellent. Filed Dec. 5, 1945, by Robert D. Spiers, doing business as Robert D. Spiers Laboratories, St. Petersburg, Fla. Claims use since Nov. 28, 1945.

75 DUST—The word dust in open letters overprinting black figure 75, for insecticides and fungicides. Filed Dec. 22, 1945 by Benjamin D. Smith, doing business as Smith Mfg. Co., Utica, N. Y. Claims use since February, 1941.

CROP KING—White letters on black circle surrounding silhouette of tree in center, for fertilizers. Filed May 28, 1945, by Oil Sprays, Inc., doing business as Crop King Co., Yakima, Wash. Claims use since 1939.

THALIZINE—In capital letters. For anthelminthic and antibacterial preparation. Filed Nov. 2, 1945, by Sharp & Dohme, Inc., Philadelphia. Claims use since Sept. 25, 1945.

PO-MURE—In capital letters. For dehydrated manure. Filed Oct. 4, 1945, by Joseph A. French, Newark, N. J. Claims use since Aug. 13, 1945.

Trade Marks Granted

420,583. FERTILIZERS. The American Agricultural Chemical Co., New York. Filed Feb. 23, 1945.

420,635. INSECTICIDES. Stratosol Corp., New York. Filed Sept. 11, 1945.

420,644. INSECTICIDES. York Pharmacal Co., St. Louis, Mo. Filed Sept. 22, 1945.

420,650. INSECT SPRAY. Ultra Chemical Wokrs, Inc., Paterson, N. J. Filed Sept. 25, 1945.

420,739. INSECTICIDES. Hans J. Diem, doing business as Southern Agricultural Insecticides, Hendersonville, N. C. Filed Aug. 23, 1945.

420,793. POULTRY AND HOG TONIC. Oscar D. Grimes, doing business as Germo Distributing Co., West Memphis, Ark. Filed Sept. 30, 1943.

420,873. DEHYDRATED MANURE. Joseph A. French, Newark, N. J. Filed Sept. 11, 1945.

420,874. DEHYDRATED MANURE. Joseph A. French. Newark, N. J. Filed Sept. 11, 1945.

420,875. DEHYDRATED MANURE. Joseph A. French, Newark, N. J. Filed Sept. 11, 1945.

420,888. INSECTICIDES. Ade B. Williams, Orlando, Fla. Filed Sept. 17, 1945.

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Calif. Entomologists Meet

A three-day joint meeting of the Pacific Slope Branch of the American Association of Economic Entomologists and the Entomological Society of Southern California is scheduled for June 26, 27 and 28, at Riverside, Calif. Headquarters for the event is the Mission Inn, where most of the sessions are to be held.

The program includes discussions by leaders in the fields of plant quarantine, biological control and new insecticides and equipment. Other features of the session include an election of officers by the Entomological Club of Southern California; a demonstration of spraying and dusting machines on the grounds of the Citrus Experiment Station, and a banquet followed by an entertainment program. H. J. Ryan is chairman of the meeting, with A. M. Boyce in charge of the program.

Fumigate 1,200 Acres of Long Island Potato Land Against Golden Nematode

FOUR agencies of the Federal government and the State of New York along with their members, are cooperating in a fumigation project in the Long Island potato growing area in an attempt to control an outbreak of golden nematode. The four main agencies active in preparation for the fumigation program include the Agricultural Research Administration of the Bureau of Entomology and Plant Quarantine, U.S.D.A.; the Division of Nematology of the Bureau of Plant Industry, Soils and Agricultural Engineering; the New York State College of Agriculture at Ithaca and the New York State Dept. of Agriculture and Markets.

According to B. M. Gaddis, of the Domestic Plant Quarantine Division of the Bureau of Entomology and Plant Quarantine, the application of fumigants will be made when funds are available, probably early this fall when conditions are at the optimum for effective kill. Involved in the project are some 1,210 acres of potato land near Hicksville in Nassau County, L. I., where the heaviest infestation is found. The land thus treated will not be used again until 1947.

The golden nematode of potato has a long history of destructiveness in Europe, but is a relatively new American pest. Discovered in the soil of Nassau County, L. I., in 1941, the nematode has demonstrated that under favorable conditions it can become a serious potato parasite. It lives on the roots of potato plants (also tomato plants) and feeds on the juices which action in turn has a dwarfing effect on the plant. This may reduce the normal crop by 50% or more. Mature female nematodes carrying an average of 200 or more eggs, drop off and remain in the soil. Counts of these cysts made in infested Long Island soil indicate populations as high as one to three billions per acre. These egg-filled cysts may live as long as eight years in the soil.

Great care must be taken to prevent spread of the nematode, since with these heavy soil populations, any soil carried from the field on potatoes, implements or even on shoes is likely to carry cysts elsewhere and propagate the disease further. In order to assure restriction of the disease within its present area, the State of New York has established a quarantine on the 1,210 acres of infested land and has limited potato movement from this area to New York City consumption or to potato chip or starch factories. The quarantine also forbids topsoil movement from infested land and requires the careful cleaning of agricultural tools and implements going to clean fields. A control is also set up on the movement of rooted plants.

To meet this situation, Mr. Gaddis states that it is proposed to

withdraw all infested land from potato and root crop production on a rental basis, and then to treat every acre of it with an effective soil fumigant. Present plans call for use of dichloropropane - dichloropropene, known commercially as "DD." A series of test plots treated in 1944 and tested by potato plantings in 1945 developed both a satisfactory treatment formula and the method of application.

The fumigant is applied to the soil after the field is plowed and thoroughly worked. A tractor, equipped with a tank and pressure pump carries the chemical and delivers it in closely calibrated amounts into the soil through six nozzles directed downward behind six shovel-type cultivator teeth, spaced one foot apart. This outfit will cover 15 to 20 acres per day. After treatment the soil is rolled to pack the surface and retain the fumes. It is thought that a few weeks after treatment plowing again to turn the surface layer under and re-treating will add to the kill since rapid dissipation of fumes from the surface reduces killing action. This treatment is not considered in any case to accomplish eradication, according to Mr. Gaddis.

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Campbell to New Position

L. W. Campbell

L. W. Campbell, entomologist, has been named Pacific Coast Sales Manager of the Insecticide Division of Industrial Management Corporation.

Mr. Campbell has long engaged in field research in agricultural insecticides, and has made studies of the effect of oil and vaporized sprays on fruit, seed, and field crops. In addition, he is credited with pioneering in airplane application of vaporized insecticides on field crops. His experience in sales work was obtained with Tidewater Associated Oil Co. and Socony Vacuum Oil Co. in supervisory capacities during the past 15 years. In his present position, Mr. Campbell will continue to conduct his research, working on aerosol insecticides for agricultural and industrial uses.

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Van Winkle to Velsicol

Velsicol Corp., Chicago, has added to its eastern sales staff Dixon C. Van Winkle, who will work out of the firm's New York office. Mr. Van Winkle is a graduate of Rutgers University, New Brunswick, N. J. Products of Velsicol Corp. include aromatic solvents, petroleum hydrocarbon resins, insect toxicants and core oils.

2, 4-D Patent Holder in Counter Suit Against Sherwin-Williams

NEW developments are forthcoming in the legal battle between American Chemical Paint Co., Ambler, Pa., and Sherwin-Williams Co., over the validity of patents held by the former on 2,4-Dichlorophenoxyacetic Acid weed killer. The latest move comes from American Chemical Paint Co., which has filed suit in Federal Court against Sherwin-Williams demanding triple damages and alleging infringement of its patent No. 2,390,941 covering 2,4-D weed killer. The complainant also alleges trademark infringement and acts of unfair competition. The action of American Chemical Paint Co. is a counter-suit against its rival, since on March 16 Sherwin-Williams entered a suit in Federal Court, Wilmington Del., asking that patents held by American Chemical Paint Co. be declared invalid, and that the latter be enjoined from bringing or threatening to bring suit against Sherwin-Williams.

As was pointed out in previous reports on the 2,4-D patent situation, the original 2,4-D patent was issued to John F. Lontz in 1943, but not for use as a weed-killer. Its purpose was to *stimulate* plant growth by use of concentrations of less than 0.1 per cent. Following research by the Bureau of Plant Industry and others, it was determined that in stronger concentrations, 2,4-D could act as a herbicide. Later, a patent was granted Franklin D. Jones, assignor to American Chemical Paint Co., which began shortly thereafter to produce and sell the herbicide.

Despite the fact that Mr. Jones and American Chemical Paint Co. held the patent, other firms began also to manufacture and market 2,4-D weed killer products under a dozen or more trade names. Mr. Jones announced his intentions to defend his patent against all infringers.

EXPERIMENT STATIONS

(*Continued from Page* 39)

dilutions of one and two gallons in 100 gallons of water. Formaldehyde was not entirely effective at a concentration of one pint in forty gallons, but was effective when four pints were used to 100 gallons. Conclusions of the investigators were that corrosive sublimate continues to be the most effective disinfectant for destroying the ring rot bacteria.

At New York State's Geneva station, work was continued from previous years to find substitutes for the scarce and expensive mercurials for control of maggots commonly found attacking cole crops. None was found that even approached either corrosive sublimate or calomel in effectiveness against the pests and safeness to the plants. Geneva

scientists gave considerable attention to control of the European chafer where the nursery industry, ornamental plantings and turf areas are involved. Much of the year's work centered on development of method for disinfecting nursery stock when "balled and burlapped" for transportation.

DDT was tested on adult European chafers, using one-half pound per 100 gallons of water. Although toxic to the beetles, it was found that they may not die for several days. Meanwhile, in some instances, females continued to lay eggs. "For this reason," says the report, "DDT is of doubtful value in control of European chafer adults."

Georgia Reports

THE fifty-seventh annual report issued recently by the Georgia Experiment Station, Experiment, Ga., presents data on the control of various insect pests and plant diseases which attack cotton, peas, beans and other crops in the area. In dealing with peanut leaf-spot, dusts and sprays were used on plants in five Georgia counties. The preparation contained sulfur and copper-sulfur 10-90 (10 parts tri-basic copper sulfate and 90 parts sulfur) and the spray was a low-lime Bordeaux (6-2-100). Three applications of dust or spray were made in each case. As a result, a noticeable increase was seen in harvested nuts. After eight tests with sulfur the average per acre increase was 198 pounds; for eight tests with copper-sulfur 10-90, 319 pounds; and for two tests with Bordeaux spray, 241 pounds, according to the report.

Experiments are also reported in control of insects in stored peanuts and peanut products. Investigations revealed that the insects enter the nuts through breaks in the shells, being unable, apparently, to burrow into sound shells. An examination of 6½ pounds of Spanish peanuts revealed that of the total, 5.8 pounds were unbroken, 0.54 pounds broken, and 0.16 pounds classified as "trash." Of the broken peanuts, (of which there were 361) 141 were free of insects, 52 were infested with beetles, and 168 with moths. The unbroken nuts were opened and found to be completely free from infestation.

INSECT CONDITIONS

(*Continued from Page* 41)

in that state at the end of April.

Cabbage caterpillars have been present in moderate to heavy populations on cabbage and related crops in parts of eastern Virginia, North Carolina, South Carolina, Alabama, Georgia, Florida, Louisiana, and Tennessee. Only light to moderate populations have been reported from other southern states and California.

The plum curculio is abundant this spring throughout most of its range, heavy infestations being reported from the Georgia peach belt and from North Carolina, eastern Mississippi, western Kentucky, southern Indiana and southern Illinois.

As of the end of April, the Mexican bean beetle and the bean leaf beetle were occurring in light to moderate infestations in parts of east-

ern Virginia, Georgia, Alabama, and South Carolina. Heavy populations of the Mexican bean beetle were reported from some parts of Florida, but bean leaf beetles were causing only minor injury in that state. No serious infestations of the potato leafhopper have been reported thus far. Heavy infestations of the corn earworm occurred in sweet corn in the Everglades section of Florida about the middle of April and severe damage to lettuce was reported from Marion county.

No serious infestations of aphids on apple, peach, cherry, or other fruits have been reported thus far although moderate infestations of the rosy apple aphid were appearing in some Illinois and Indiana orchards in late April and early May. Only a moderate infestation of the spirea aphid developed on citrus in Florida this spring and in southern California infestations of this and other aphids on citrus have been generally less than normal.

Light, but widely distributed populations of the pea aphid were present on peas and alfalfa on the Eastern Shore of Virginia and Maryland, and on peas in the Charleston, South Carolina district and in northwestern Tennessee. In part of the Tennessee area infestation was heavy, requiring control over considerable acreage. A serious infestation of that insect occurred during the latter half of April on several hundred acres of winter peas grown principally for soil improvement or seed purposes in Washington County, Mississippi. Pea aphids were numerous on alfalfa in the Toppenish, Washington, district and in the Imperial Valley of Califoria, while in the Blue Mountain area of eastern Washington and Oregon threatening populations were building up in pea fields toward the end of April as a result of movement from alfalfa. Early season examinations in Wisconsin indicate a probable heavy pea aphid infestation on peas and alfalfa.

Aphid populations on cole crops continued generally at low level in all areas except parts of South Carolina, southern Arizona, and southern California (Imperial Valley). In the latter area the cabbage aphid was reported as causing considerable injury to seed crops of cauliflower. Heavy infestations of aphids have persisted on various vegetable crops, particularly cucumber, tomato, pepper, potato, and eggplant in parts of Florida. A heavy melon aphid infestation threatened 50,000 acres of watermelons in southern Texas early in April and later in the month melon aphid infestations were starting in the melon fields of Imperial County, California. Moderate aphid infestations were present on lettuce in southern Arizona about the middle of April. In San Diego County, California, a heavy infestation of celery aphid that could not be controlled due to lack of sufficient nicotine reduced the quality of the celery, causing a recorded loss of at least $1,000,000 in that county alone.

Thrips have caused injury to beans in the Bradenton and Everglades districts of Florida and heavy infestations of onion thrips have oc-

curred on cabbage in the Sanford district of the State. Onion thrips populations have been on the increase on onions in eastern Virginia, Florida, Tennessee, southern Arizona, and southern California, and infestations have been reported from the Charleston district of South Carolina and from central Washington. A normal infestation of citrus thrips is developing in southern California.

LISTENING POST

(*Continued from Page* 41)

who did attempt to control the disease by means of a spray or dust used materials that gave little or no control. Control was obtained in the tomato spray test plots at Homestead by the application of "Dithane"-zinc sulfate-lime at five-day intervals, also by the use of two new dithio-carbamate reaction products (Du Pont No. IN-5446. "Dithane D-14," a zinc reaction product of Rohm and Haas) at the same rate of application.

In the large tomato section near Dania in Broward County packers and shippers estimate that the crop will be reduced about 50 per cent. Late blight has been the greatest contributing factor in the yield reduction, although growers state that this has been a poor growing season on the East Coast. In Palm Beach and Martin Counties late blight has caused abandonment or replacement of many newly transplanted fields. There has probably been a greater total loss of mature fields in Martin County than in Palm Beach County.

"Dithane"-zinc-lime spray and Copper-A spray and dust (6% metallic copper) have been used extensively in the three counties to prevent and retard the spread of late blight. Although fungicidal applications have not been regarded as satisfactory, they have proved profitable. Growers who have maintained a regular spray or dust schedule have not been able to keep the foliage free from infection, but have been able to keep the fruits relatively free and in satisfactory condition for green shipment. Foliage reduction, however, has tended to limit plant growth and indirectly to reduce yield regardless of the best spray and dusting efforts. Late blight also has been prevalent on garden plots and fields of tomatoes in the Everglades. A few growers have been successful in controlling the disease with the "Dithane"-zinc-lime spray.

CROP NUTRITION

(*Continued from Page* 24)

The requirements of plants vary, but nature tries to protect seed or fruit by maintaining a relatively constant mineral content for a given species, and it has been difficult to effect any material change in this. Absorption of mineral elements appears not wholly passive, for plants have a certain power of selection of food. Effort has been made to increase the calcium content of the tomato, but no tomato has been made to accept calcium enough to be a factor in human nutrition. It has been possible to a certain extent to in-

crease the mineral content of leaves. Storage in leaves may be just a method for disposal of excesses in order to protect fruit and seeds from an over-supply. Alkali leaf scorch on leaf edge is believed to be a means of getting rid of sodium ion. The only method a plant has of elimination is storage in leaves which eventually drop off.

Undoubtedly the nutritional quality in foodstuffs is very important, and probably all lowered values may not necessarily result from improper preparation, cooking, or preserving for human diet. Comparatively little is known about the various proteins, yet mineralization of vegetables is even a bigger and more obscure problem. No one knows the amount of an element vegetables should contain nor how to determine its availability for human metabolism. Even if desired goals of mineralization were known as far as human nutrition is concerned, we still do not know how to get the plant to cooperate.

Much additional information in regard to the nutritional requirements of plants is needed, but proper experimentation in this field is difficult. A big tomato in comparison with two little ones from another field looks impressive but does not necessarily have any meaning from a nutritional point of view. In like manner comparison of sizes of plants is without significance, for plants are not of the same size even when grown under the same conditions. Irrigation might make a larger plant and increased yield, but there is no evidence that there would be increased nutritional value of the fruit.

From the standpoint of nutrition there are few dependable means of comparison, and these are useful only in the hands of persons who are trained and qualified to judge the factors. Measures such as size, firmness, taste, and moisture content have nutritional meaning only when a large number of tests are involved. The old controversy of cane vs. beet sugar was settled after many years when it was proved that there was no difference between them. On the other hand the problems in this discussion are very complex and perhaps no one simple solution is possible. Applying a motto of a great commercial research department "This problem when solved will be simple."

One does not know in advance that there will ever be a deficiency of a particular micro-nutrient on a particular farm. There is no way to tell until symptoms appear, as diagnosed by an expert in that branch of agriculture. If there are serious deficiencies, the yield drops off and as the farmer is interested in crop tonnages he must correct them or go out of business.

Fertilizer Program Needed

DEVELOPMENT of quick freeze and other processes make a dependable quality of vegetable more important than ever before. Perhaps the excellent overall harvest records on potatoes afford a guide. California alone spends 50 million dollars annually for gross tonnages of fertilizers, but an inadequate portion of that amount for research to determine exactly what is needed to produce plants of the highest quality. The nation should have an over-all study and fertilizer program, but this is not yet developed.

Growers have always been confronted with questions that cannot be answered, and because of the nature of the problems, this will be the situation for a long time to come, in spite of excellent and increasing investigations. At present one cannot go to a particular field and tell a farmer just what to apply as a fertilizer. One should go only so far as research has demonstrated the accuracy of opinions.

There has been much discussion in general terms with regard to treating soils to improve the nutritional value of crops, often based on a vague and misleading assembly of purported facts which at best are only partially true. Constant repetition of such statements sometimes leads to their acceptance as facts, and the farmer and the public both suffer. One should stick to recognized practices until the experiment station advises otherwise.

GUEST EDITORIAL

(*Continued from Page* 12)

developed by intensive research which will more and more nearly approach the ideal means of insect and fungus control. We are also advancing rapidly in the field of commercial herbicides, which may go a long way toward taking that drudgery from food and fiber production which often has made farm life unattractive. The new chemicals which have been developed during the war period promise almost to revolutionize our methods of production. Further research and actual field use are necessary to determine to what extent the sensational claims made by some feature writers are justified.

It seems to me that a great opportunity lies ahead for our manufacturers of economic poisons. That opportunity also carries with it a tremendous responsibility. I am confident that this responsibility can be met by the concerted action of organizations such as the Association of Insecticide and Fungicide Manufacturers, where those in the trade are joined together, not for the exploitation of those who so badly need their product, but to render them a service commensurate with their great need. I believe that we are taking a forward step when we seek to have passed by Congress and by the various states a uniform insecticide and fungicide law which is practical and can be efficiently administered by our Federal and State agencies. A comprehensive and carefully thought-out law which can be practically applied is of the utmost assistance in enforcement work.

I am confident that our Federal and State agencies are earnest and sincere in their desire to protect both our producers of food and fiber and our reputable manufacturers of insecticides and fungicides. Knowing, as I do, most of our State Commissioners, Secretaries and Directors of Agriculture throughout the country, I can confidently predict that we can all go

forward together into this period of expansion. An equitable and realistic insecticide law will enable us to do this with every assurance that our producers, our manufacturers, and our Federal and State officials, can accomplish our ultimate purpose. This purpose, as I see it, is to provide for our great consuming public (and we are all consumers), the high quality products of agriculture which will keep us the best-fed and best-clothed nation in the world.

COMMENTS

(*Continued from Page* 34)

damage suits for injury from economic poisons, dissatisfied customers, or the law, who do the fair thing. The cautions for DDT recommended by the United States Department of Agriculture in administration of the Insecticide Act of 1910 represent the best information. These may be summarized as follows:

1. Avoid skin contact and breathing dust or spray mist.
2. Avoid contamination of foodstuffs.
3. Do not use solutions in oil on household pets or human beings, do not smoke while spraying such solutions, nor spray them into or near fire.
4. Wash thoroughly with warm water and soap before eating or smoking.
5. Clean up spillage.

Warnings about use of DDT suggest advisable additions beyond the name of the product and certain other information at present required on the label of every economic poison. With respect to substances for which the word POISON with the vignette representing the skull and crossbones and an appropriate antidote are required, the manufacturer of many old-time products could well adopt for his labels, where they apply, precautions similar to those promulgated for DDT.

The proposed Federal Insecticide, Fungicide, and Rodenticide Act, Sec. 13, would prepare the way for official cooperation when it says, "The Secretary is authorized to cooperate with any other department or agency of the Federal Government and with the official agricultural regulatory agency of any State, or any State, Territory, District, possession or any political subdivision thereof, in carrying out the provisions of this Act, and in securing uniformity of regulations." A more complete understanding of the whole field of agricultural chemicals and better acquaintanceship between the manufacturers, users, and officials should develop a proper spirit. Some people have less judgment than others, but if they are sufficiently intelligent they should be able to restrain antagonisms and animosities and adopt the unselfish principles of mutual trust and cooperation.

PROMOTION NEEDED

(*Continued from Page* 30)

ments. The farm always has been and it always will be the seed bed of the Nation's population and it is the Nation's responsibility to preserve it. If we are to remain strong in time of

peace and invincible in time of war, we must maintain in this country a large and dignified farm population.

One shudders to think what would have happened in the tragic conflict just ended had it not been for the rich reservoir of under-employed farm boys and girls who hurried off to war plants and the armed services to add the winning punch to the all-out effort. The strength, conservatism and solidarity of this country stem directly from the resourcefulness, dogged determination and solid character of our country people. And if we as leaders in the agricultural fraternity should fail to place within the grasp of farm youth an opportunity to succeed on the land, we stand as states and as a Nation to lose some of those sturdy virtues that have made America great.

If, on the other hand, those of our number in a position of leadership in this industry will work out the common denominator of pest control, present it in a concise, catchy style, then all join hands in one gigantic crusade, we can not only cut crop losses and develop an undreamed of volume of business, but make a genuine contribution toward preserving agriculture as a pleasing way of life and as a profitable means of making a living on the land.

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Small Fruit Pest Control

An informative article on how to control insects and diseases of small fruits appeared in the April, 1946 edition of *American Fruit Grower*. The feature, written by L. Carl Knorr of Michigan State College, describes the symptoms of various plant diseases, and tells what remedies are effective in their control. He lists fifteen insects and diseases attacking raspberries and blackberries, eight disease and insect hazards for currants and gooseberries, and eight for strawberries. A number of illustrations including those showing crown gall infecting raspberry canes, and strawberry leaf rollers in action accompanied the article.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of Agricultural Chemicals, 254 W. 31st St., New York 1. Closing date: 1st of month.

Entomologist: M. S. Cornell University. One year with N. Y. State Dept. Agri. Four years Army. Sanitation and Med. Asst. officer. Seeks position as Entomologist with insecticide firm. N. Y. City or vicinity preferred. Address Box No. 106, care of *Agricultural Chemicals*.

Entomologist: with fifteen years experience in sales and research on west coast desires to make change. Capable of handling any phase of the insecticide business. Many fine contacts. Address Box No. 105, care of *Agricultural Chemicals*.

Free Advts. for Veterans

As a service to veterans seeking jobs in the agricultural chemical field, this magazine will accept, without charge, classified advertising from World War II veterans seeking positions. Advertisements should reach us before the first of the month of publication, and should include all essential information, such as experience, skill, age, type of work sought and location desired. Address Agricultural Chemicals, 254 West 31st St., New York 1, N. Y.

Chemist Wanted: Well-known manufacturer of basic insecticide materials requires services of young chemist, preferably Ph.D., who has had some experience in laboratory and factory control of these products. Give full educational and employment record, and salary required. Box No. 107, care of *Agricultural Chemicals*.

Plant Manager: Man who has had at least five years experience in plant operations in chemical specialties, insecticides, or detergents for medium size factory in east. Good future with progressive firm. Man should be graduate in chemistry. Give details to Box No. 108, care of *Agricultural Chemicals*.

Sales Agent: Operator of sales office in mid-west covering Ohio, Indiana, Kentucky, Southern Illinois open to handle one or two additional non-competitive lines in chemical raw material field. Well-known in mid-west. For further details consult Box No. 109, care of *Agricultural Chemicals*.

AIRPLANE SPRAYING

(*Continued from Page* 19)

range lands; distributing fertilizer; applying defoliants to cotton; and weed killers to crops and crop lands. They have been used experimentally and with promising results during the past two years for spraying forested areas in New England, Canada, and on the West Coast; and for treating experimentally legume seed crops, sugar beets, sweet corn, peas, beans, and potatoes. Until recently most airplane dusting was in the cotton and truck crop areas of the country. Insecticides that have been applied successfully in dust form from aircraft include the arsenicals, nicotine, sodium fluosilicate, cryolite, sulfur, and more recently rotenone, pyrethrum, and DDT.

Much of the credit for improvements made in airplane crop dusting equipment in recent years belongs with a few commercial operators who have made a conscientious effort to develop equipment for releasing an even flow of dust of different textures. In many instances

these men have worked closely with public and private research agencies at their own expense, in a cooperative effort to improve aircraft dusting standards. All concerned have benefited including the farmers, many of whom have come to rely on the commercial duster for advice as to when to dust, what insecticide to use, and how much to apply.

Although crop dusting installations have not been standardized and planes used for this purpose have generally been converted by the owners locally, the better units are fundamentally much alike; the principal differences are in the type of agitators used and the venturi designs. The equipment developed by C. N. Husman for distributing grasshopper and Mormon cricket bait, described in Bureau of Entomology and Plant Quarantine circular ET-212, is representative of a type generally used for both dusting and bait spreading. However, the specifications appearing in this publication are for a New White Standard biplane, powered with a 285 h.p. motor, and they require modification for installation in any other make or type. Also, many refinements have been made in dusting equipment since Husman's work was published.

(Part II of AIRPLANE SPRAYING Will Appear Next Month)

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Rohm & Haas Promotes

A series of promotions in the personnel of Rohm & Haas Company has brought changes to a number of men in the firm. R. N. Lindabury has assumed the duties of assistant to Vice-President Dr. D. S. Frederick in the firm's Philadelphia office. The place vacated by Mr. Lindabury is filled by Bernard Barton, recently returned from the U. S. Navy. New Assistant Sales Manager is Carlos Kampmeier, who works under the supervision of D. F. Murphy, manager of the Agricultural and Sanitary Chemicals department. Mr. Kampmeier was previously located in the Chicago territory.

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Dairy Germicides Tested

The germicidal properties of 42 materials obtained from 14 manufacturers were recently studied by the Dairy Industry Dept. of Massachusetts Agricultural Experiment Station, Amherst, in a search for new sterilizing agents practical for dairy equipment. Of the 42 materials, 15 were found to be effective as sterilizing agents, seven moderately effective, and 20 ineffective, according to a progress report included in the stations 1945 annual report.

DDT and MUSHROOMS

(Continued from Page 25)

large numbers of dead adults were observed on the beds. On the surface of one box, which had been planted late and produced only a few mushrooms, fifty dead flies to the square inch were counted uniformly over the entire surface of the box. In general, dead flies were most abundant in the cavities where mushrooms had been pulled out. These cavities frequently

contained fifty or more dead flies, some of which had not completely emerged from the pupa. Both flies and maggots persisted in relatively low numbers throughout the two-month period during which DDT was used. The flies occurring after several applications of DDT caused little injury to the mushrooms and did not materially decrease the yield. However, it seemed desirable to add either a thiocyanate or pyrethrins to the DDT powder, or to follow DDT by a spray containing one of these insecticides, in order to get a faster kill.

The yield of mushrooms was favorably affected by dusting with DDT, as shown in Table I below. Normally about 50% of the crop is harvested during the first month, 25% during the second month, and the remaining 25% during the last two months of harvesting. As shown in Table I, 50% of the crop was generally harvested during the first month, but much less than 25% was picked during the second month in all the plots—presumably due to the increased population and activity of the insects. By dusting with DDT after two months the yield was substantially improved. It was increased over the previous month in half of the plots. Also the yield for the fourth month was increased over the second month in five boxes out of sixteen. These data show conclusively that DDT had a favorable effect on the yield under the conditions of this experiment. Furthermore, the quality of the crop was materially improved by the treatment.

During the winter of 1945-46 the 3% DDT powder was dusted on mushroom beds in a commercial mushroom house in Duluth. The flies which appeared after harvesting mushrooms for five weeks, were kept completely under control by dusting with DDT. Dusting with this insecticide was required only 4 times during the crop. No damage occurred to the mushrooms and a good yield was obtained. Dusted mushrooms contained 2.6 ppm DDT. After washing, however, no DDT was detected in the mushrooms. (Analysis for DDT supplied by Dr. Ferguson.)

Conclusions

A 3% DDT powder dusted on mushroom beds after the mushrooms had been picked off and the beds watered will greatly reduce injury to mushrooms by *Sciara* flies. The use of thiocyanates or pyrethrins in conjunction with DDT is advisable in order to obtain a more complete kill. Three per cent DDT dust caused no injurious effects on the growth of the mushrooms in this experiment, and no ill effects were noted by those who ate mushrooms from treated beds.

The writer expresses his sincere gratitude to Dr. J. H. Lilly of the University of Wisconsin for reviewing and editing this report.

TABLE 1

Yield of Mushrooms Before and After Application of 3% DDT Dust

	Before Applying DDT		*After Applying DDT*		
*Plot No.** (*6 sq. ft. each*)	*1st Month Grams*	*2nd Month Grams*	*3rd Month Grams*	*4th Month Grams*	*Total*
2	3391	976	1373	811	6551
3	2429	1105	911	663	5108
4	1744	877	954	1063	4638
5	1025	571	933	821	3350
6	1700	943	982	1051	4676
7	3310	861	787	958	5916
8	1538	878	1005	538	3959
9	3775	904	813	1031	6523
10	3523	1258	988	1074	6853
11	3092	860	1042	776	5770
12	2030	807	685	558	4080
13	2531	980	814	857	5182
14	1891	1100	856	780	4627
15	2529	1325	905	714	5473
16	3579	938	1074	852	6443
17	3687	1267	1289	697	6940

* These synthetic composts were of different compositions and in the present analysis are significant only in the quantity of mushrooms each produced monthly.

Advertisers' Index

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

TALE ENDS

PUBLIC misunderstanding concerning the use of 2,4-D weed killer as "an aid in the cure of hay fever" has increased to the extent that the U. S. Department of Agriculture emphasizes in a recent announcement that the chemical is not a drug as has been construed from a number of reports. The only effect 2,4-D has on hay fever, it points out, is by indirection through its destructive effect on ragweed, the principal cause of hay fever.

•

In response to publication of the first issue of *Agricultural Chemicals*, we received a flattering pile of mail. We only wish that we could publish half of it. The congratulations and good wishes would warm a heart of dry ice. But we also received some letters of criticism and others containing numerous suggestions which have already been or will be acted upon. To say that the interest aroused by our first issue was gratifying to us is a masterpiece of understatement. No publishing staff could receive a greater incentive to produce the finest magazine in the world.

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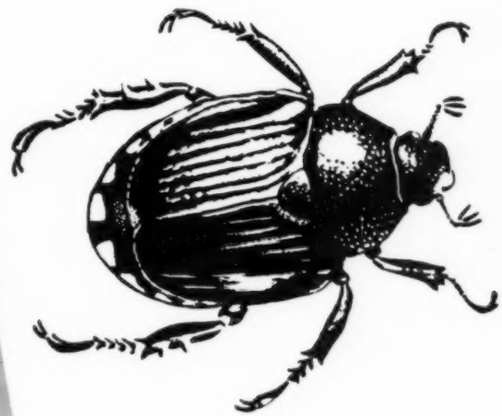
A recently-published Associated Press photo of an elderly gentleman in Italy en route to join the fight against a locust invasion, no doubt brought amused smiles to the faces of persons in the American insecticide industry. His means of getting to the infested area was astride a burro, which appeared indifferent to the impending battle. On the back of the man was a hand spraying outfit with which he would do his bit toward repelling the insects. Upon viewing this evidence of inadequate methods of insect control, American growers should have at least a partial answer to the question of why more food is needed abroad.

JAPANESE BEETLE



BUG OF THE MONTH

Here's the villain of the month—the Japanese Beetle, a general foliage feeder that during the past 10 years has over-run many States in destructive abundance. Preliminary tests indicate that DDT Insecticides are the most effective products yet discovered for use against this pest.

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5. Pyrethrum Powder—A specific for many agricultural pests. Finely ground and adapted for agricultural dusts where Pyrethrum is necessary.

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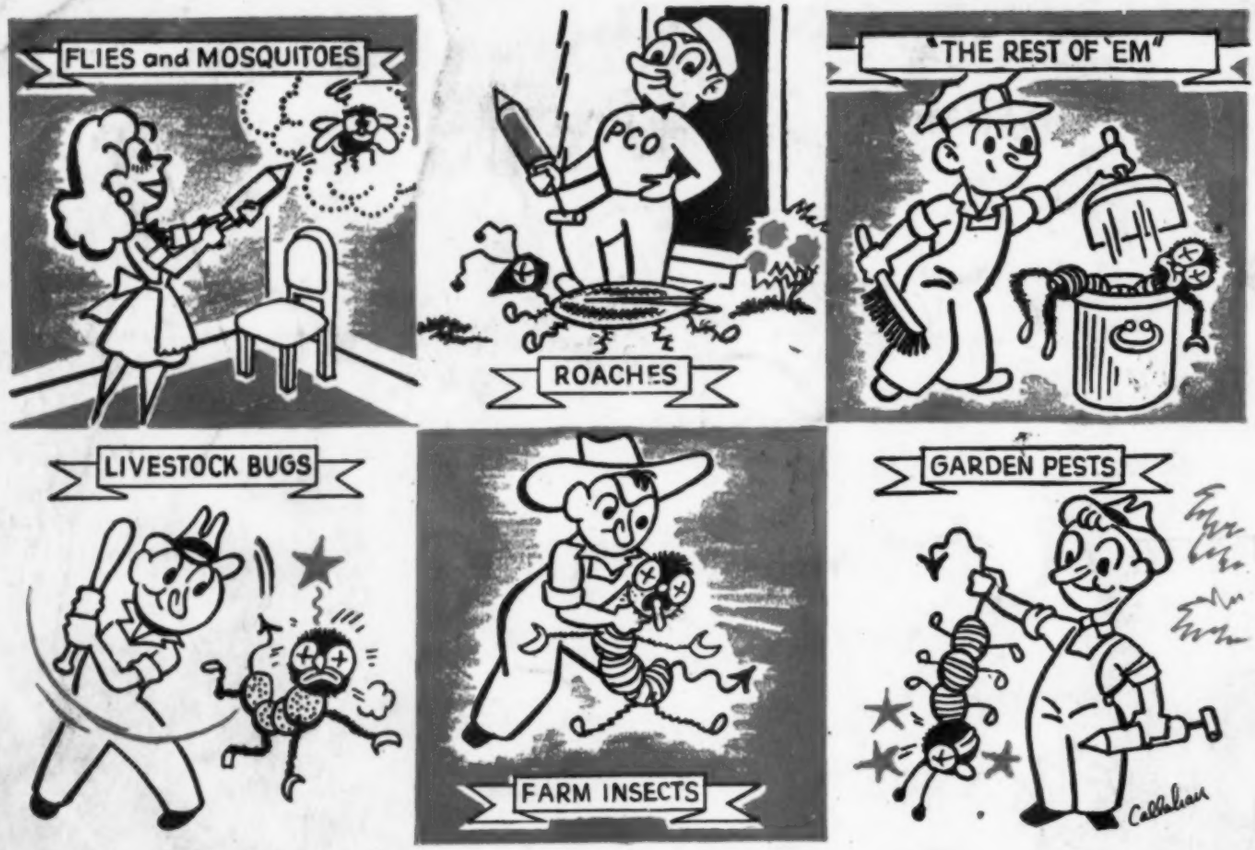

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